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ERRATA.

Page	3	line	41	for " *Irichopsylla* "	read " *Trichopsylla* "
,,	9	,,	30	,, " *Potomachoerus* "	,, " *Potamochoerus* "
,,	18	,,	16	,, " *Thelahonia* "	,, " *Thelohania* "
,,	20	,,	26	,, " THOMPSON "	,, " THOMSON "
,,	21	,,	23	,, " *Popyplax stephensis* "	,, " *Polyplax stephensi* "
,,	33	,,	36	,, " List."	,, " Theo."
,,	38	,,	29	,, " yams "	,, " taro "
,,	46	,,	1	,, " BOREL (E.) "	,, " BOREL (M.) "
,,	54	,,	17	,, " [Veshezerov] **Вешезеров** "	,, " [Veshchezerov] **Вещезеров** "
,,	68	,,	29	,, " 20 "	,, " 11 "
,,	118	3 lines from end for " *albicintus* "			,, " *albicinctus* "
,,	125	line	26	for " *confinis* "	,, " *confinnis* "
,,	128	,,	38	,, " RODEL "	,, " RODET "
,,	128	,,	40	,, " Sieva "	,, " Siwa "
,,	165	2 lines from end after " sp.n." insert " [Fouts] "			
,,	172	line	30	for " *ferruginum* "	read " *ferrugineum* "
,,	213	,,	10	,, " *testudinarum* "	,, " *testudinarium* "
,,	221	,,	5	,, " *A. saxicola* "	,, " *A. listoni* "

IMPERIAL BUREAU OF ENTOMOLOGY.

REVIEW
OF
APPLIED ENTOMOLOGY.

SERIES B.

VOL. XIV.] [1926.

EDITORIAL.

As particulars of the number of abstracts in the two series of the *Review of Applied Entomology* were last published in volume iv and as ten years have now elapsed, the following table showing the number of articles abstracted in the *Review* during the past three years, grouped under the countries in which they were published, may be of interest for purposes of comparison. The figures recorded in volume iv were 1,037 (1913), 1,494 (1914), and 1,773 (1915).

	1923.	1924.	1925.
Africa, British (including Egypt, Mauritius and Seychelles)	80	106	131
Africa, other than British	51	37	26
Australia, New Zealand and Pacific Islands	120	124	125
Austria, Hungary, Czechoslovakia, etc. ...	37	32	49
Canada	102	102	85
Central and South America	105	118	107
Denmark	7	7	2
East Indies and the Far East	116	112	101
France	216	216	236
Federated Malay States	19	8	10
Germany	161	175	292
Great Britain	269	246	272
Hawaii	22	12	21
Holland, Belgium and Luxemburg	47	55	33
India and Ceylon	103	114	95
Iraq	1	1	4
Italy	81	58	57
Malta and Cyprus	4	—	4
Palestine	4	8	2
Russia, Finland, Estonia, etc....	93	113	189
Scanidinavia	8	11	14
Spain, Portugal and Colonies	39	18	7
Switzerland	15	20	27
United States of America	693	740	588
West Indies	46	38	37
	2,439	2,471	2,514

(K2840) Wt P7/D23 1,500 1/26 H & Sp Gp 52

The system under which a given part contains abstracts of all papers received by the Bureau up to within some eight weeks of the date of publication, which was inaugurated in 1916, has not only been maintained during the ten years that have elapsed, but has been slightly improved. Thus, the present part, published in January 1926, contains all the matter received up to the 10th December 1925.

Authors are reminded that they can co-operate in making the *Review* even more up-to-date by sending separates of their papers immediately on publication, especially when they appear in obscure or non-entomological journals.

It has been thought advisable to make some change in the titles of papers published in Russian and allied languages, and the following system will henceforward be used in the *Review* in connection with titles originally appearing in Slavonic alphabets.

The name of the author transliterated in [ ] will be followed by his name in Slavonic characters.

An English translation only of the title will be given, followed by a note in [ ] indicating the language in which the original is published.

The reference to the journal will be given in transliterated form, followed where necessary by a translation in [ ], except where an alternative title in a language other than Russian, etc., is printed on the original, *e.g.*

[Yachevskiĭ (A.).] **Ячевский (А.).** The Question of Uniting Entomo-Phytopathological Work by means of Central Institutions. [*In Russian.*]—Byulleten' 2-go Vserossiĭskogo Éntomo-Fitopatologicheskogo S'ezda v Petrograde 25–30 Oktyabrya 1920 g. [*Bull. 2nd All-Russian Entomo-Phytopath. Meeting*], no. 3, pp. 2–6. Petrograd, 27th October 1920.

In the event of an author who is known to have published papers in Slavonic, also publishing in other languages and using a transliteration for his name different from that adopted in the *Review*, his name will be given as in the original preceded by the *Review* transliteration in [ ], *e.g.* [Yachevskiĭ (A.).] Jaczewski (A.).

The system of transliteration is based on that used in the British Museum, and is as follows :—

А — a	Ј — i	О — o	У — u
Б — b	И — ī	Ѵ — œ	Ы — ui
Ћ — ć	Й — ĭ	П — p	В — v
Ч — ch	Џ — j	Р — r	Я — ya
Д — d	К — k	С — s	Ѣ — ye
Е — e	Х — kh	Ш — sh	Ю — yu
Э *or* Є — é	Л — l	Щ — shch	З — z
Ф — f	Љ — l'	Т — t	Ж — zh
Ѣ — g'	М — m	Ѳ — th	Ъ — ‘
Г — g *or* h	Н — n	Ц — tz	Ь — ’
І — i	Њ — n'		

FOX (C.) & SULLIVAN (E. C.). **A Comparative Study of Rat-flea Data for several Seaports of the United States.**—*Pub. Health Repts.*, xl, no. 37, pp. 1909–1924, 16 charts. Washington, D.C., 11th September 1925.

In view of Robertson's conclusions with regard to the incidence of plague [*R.A.E.*, B, xi, 159] which are quoted, it was deemed advisable to obtain data concerning the varieties of fleas and their prevalence on rats in various ports of the United States. Such data might be expected to have an important bearing on the possibility of the spread of bubonic plague in case of its introduction and on the measures to be adopted.

Similar surveys of the past are reviewed; those here discussed refer to Boston, New York and New Orleans. *Ceratophyllus fasciatus*, Bosc., *Xenopsylla cheopis*, Roths., and *Leptopsylla musculi*, Dug., were found in all three ports. Though it is not advisable to draw conclusions from these surveys, it is significant that in New Orleans, where plague has actually existed, *X. cheopis* is the predominant rat flea throughout the year, while *C. fasciatus* is almost absent, but in the northern cities under discussion the latter is the predominant species, and *X. cheopis* only occurs in greater numbers during a few months of the year. In New Orleans the average number of fleas per rat is consistently high as compared with that in New York and Boston. A number of graphs are given illustrating the relation between the occurrence of the fleas and the relative humidity. Temperature and humidity are important factors in the average number of fleas per rat as well as in the numbers of *X. cheopis*, the latter tending to rise and fall with the humidity.

Other fleas found on rats in different localities, in small numbers, are *Ctenocephalus canis*, Curtis, *C. felis*, Bch., *Echidnophaga gallinacea*, Westw., and *Ctenophthalmus pseudagyrtes*, Baker. *Pulex irritans*, L., was not taken in the New York or Boston surveys.

Other parasites recorded are *Polyplax spinulosus*, Burm. (common rat louse); *Philandesia foxi*, Ewing, on *Mus norvegicus*; *Laelaps echidninus*, Berl. (common rat mite); and *L. hawaiiensis*, Ewing, on *M. rattus*.

[BURESH (Ī.).] **Бурешъ (И.). A Small Contribution to the Ecto-parasitic Fauna of some Wild Mammals occurring in Bulgaria.** [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, ii, pp. 90–92. Sofia, 1925.

The species recorded are: *Nycteridopsylla eusarca eusarca*, Dampf, and *Ischnopsyllus octactenus*, Kolen., from *Pipistrellus pipistrellus*; *I. elongatus*, Curt., from *Pterygistes noctula*; *Irichopsylla globiceps*, Tasch., from *Canis vulpes*; *Doratopsylla dasycnemus*, Roths., from *Sorex araneus*; *Ceratophyllus sciurorum*, Schr., from *Myoxus glis*; *Ctenophthalmus curous*, J. & R., and *Ceratophyllus mustelae*, Wagn. (*turbidus*, Roths.), from various rodents; *Hystrichopsylla talpae*, Curt., from *Mus sylvaticus*; *Leptopsylla fallax*, Roths., and *Rhadinopsylla* sp., from *Microtus subterraneus*; *L. musculi*, Dugès, from *Mus rattus alexandrinus*; and *Ctenophthalmus assimilis*, Tasch., from *Cricetus nigricans*.

DAMPF (A.). **Ectoparasitos del perro, colectados en los meses de Julio a Noviembre de 1924 por el Servicio de Desinfección y Desinsectización del Departamento de Salubridad Publica de Mexico.** [Ectoparasites of the Dog, collected in July–November 1924 by the Mexican Disinfection Service.]—*Bol. Dept. Salubridad publica*, no. 2, pp. 33–42, 4 figs. Mexico, D.F., 1925.

Parasites taken from dogs in Mexico City were almost all fleas, *viz.*, *Ctenocephalus felis* (43·7 per cent.), *C. canis* (33·7), *Pulex irritans* (22·5) and *Echidnophaga gallinacea* (0·06). A few filariae were found in *C. felis* only. Some specimens of the dog louse, *Haematopinus* (*Linognathus*) *piliferus*, Burm., were also found.

SPENCER (R. R.) & PARKER (R. R.). **Rocky Mountain Spotted Fever: Vaccination of Monkeys and Man.**—*Pub. Health Repts.*, xl, no. 41, pp. 2159–2167, 2 pls. Washington, D.C., 9th October 1925.

The preparation of a potent vaccine against Rocky Mountain spotted fever from emulsions of ticks, *Dermacentor venustus* (*andersoni*) [*cf. R.A.E.*, B, xi, 89; xiii, 52] is dependent upon a high concentration of virus in the ticks from which it is prepared and cannot be obtained from the tick in the same stage in which it receives the infection. Virus ingested by larvae does not increase until the nymphal stage, while in the adult stage the increase is often greater than in the nymphs. Ticks from which vaccine is to be prepared must, therefore, be reared the previous year. Adult male and female ticks, free from all infections, are placed on rabbits, where the females become engorged and fertilisation takes place. Each female is placed in a separate pill-box, over moist sand, and its progeny reared. The larvae are permitted to engorge on a rabbit infected with Rocky Mountain spotted fever, and the nymphs on an uninfected rabbit. After each engorgement emulsions from a few ticks of each batch are injected into guineapigs to test for the presence of the spotted fever infection and the absence of any other infection. When the ticks become adult they are permitted to remain quiescent for a few months, and are then allowed to feed for three days on guineapigs, in lots of 100. The viscera of the engorged ticks are ground in a mortar with sterile sand and a little salt solution. The emulsion obtained is diluted with salt solution so that 1 cc. contains the equivalent of 2 ticks, and is then tested by injecting graded dilutions into guineapigs to find the minimum infectious dose; if this is more than 0·001 of a tick the material is not satisfactory; a minimum infectious dose of 0·0002 of a tick is desirable. The emulsion is again diluted with salt solution so that it contains the equivalent of 1 tick per cc., and phenol to the strength of ½ per cent. is added. The mixture is then allowed to stand for two or three days, and the precipitate that forms is separated by slow centrifugation. The super-natant fluid is used as the vaccine. 1 cc. of the vaccine has invariably rendered guineapigs immune from injections of virus when the minimum infectious dose of the live virus emulsion was 0·0002 cc.; guineapigs receiving 2 doses of 1 cc. have remained immune for 8 months. The vaccine loses its protective quality, as a rule, after 5 or 6 weeks. Inoculation of monkeys with 1 to 3 cc. vaccine conferred complete immunity to 1 cc. blood virus or 0·1 cc. tick virus; control monkeys similarly infected with virus all died of spotted fever. Inoculation of man has been performed without severe reactions

resulting in 34 cases, 1 to 4 subcutaneous injections being given in each case, in doses of 1 or 2 cc., containing 1,000, 5,000, or 10,000 minimum infectious doses (to guineapigs) of killed virus. One man who had been twice inoculated with 1 cc. doses developed Rocky Mountain spotted fever on the day following the second injection. The fever was, however, mild, and the patient recovered. It therefore seems probable that inoculation modified the attack. It is thought that inoculation of persons who are especially exposed to infection, each spring, would be beneficial.

Sera from inoculated guineapigs, rabbits, and human beings, mixed with virus, injected into guineapigs greatly modified the effect of the virus, as shown by controls. It is therefore evident that virus-neutralising properties are possessed by the sera of men and animals that have been inoculated.

Tick Juice as a Protection against Rocky Mountain Spotted Fever.—*Science*, lxii, no. 1610, suppmt., p. xii. Garrison, N.Y., 6th November 1925.

This is a shortened account of the subject dealt with in the preceding paper.

Puri (I. M.). **On the Life-history and Structure of the Early Stages of Simuliidae (Diptera, Nematocera). Parts I & II.**—*Parasitology*, xvii, nos. 3 & 4, pp. 295–369, 2 pls., 21 figs. Cambridge, August & October 1925.

The nomenclature of Edwards [*R.A.E.*, B, iii, 140; ix, 41] in his work on the British Simuliids is followed in this paper; and the author's investigations on the early stages of the British species as well as upon some from Northern Europe tend to confirm the conclusions arrived at by Edwards from his studies of the adults. Keys are given to the full-grown larvae and the pupae of British Simuliids; those from Northern Europe are to be described in a subsequent paper.

The external and internal anatomy of the larva and pupa of *Simulium nölleri*, Fried., is described in detail, but in the case of the remaining 16 species only the specific characters have been dealt with.

No difficulty was experienced in rearing the Simuliids from egg to adult under laboratory conditions. The two important factors in rearing the larvae are abundance of food (they feed on all kinds of fresh water animalcules and algae) and the aeration of the water. The gradual changes of the successive larval stages in *S. erythrocephalum*, DeG., and *S. aureum*, Fries, are described. The eggs are laid in large patches on aquatic plants below the surface of the water, and the larvae are found in fast running streams. A number of larvae reared from eggs taken from the River Cam became infected with a microsporidian parasite, the presence of which resulted in a prolonged larval period and failure to pupate.

Hindle (E.) & Duncan (J. T.). **The Viability of Bacteria in** *Argas persicus*.—*Parasitology*, xvii, no. 4, pp. 434–446, 1 pl., 2 figs. Cambridge, October 1925.

It is obvious that ticks, when sucking blood, must occasionally ingest bacteria, if only septicaemic forms, but with the exception of

certain species of blood spirochaetes and *Bacterium tularense* no evidence has been published that they persist in the tick after being ingested. Experiments were therefore undertaken with various bacteria including the following pathogenic species: *Bacillus anthracis*, *B. pestis*, *B. melitensis* var. *abortus*, *B. typhosus*, *Staphylococcus pyogenes* var. *aureus*, and *Leptospira icterohaemorrhagiae*. The effect of the various internal secretions of the tick on these is discussed. In all cases of ticks fed on bacterial cultures the micro-organisms remained within the alimentary canal. *B. anthracis* was found to survive indefinitely in the alimentary canal of *Argas persicus* and to be passed in its faeces. As this is the only method by which the bacteria were found to leave the tick (*B. anthracis* alone of the pathogenic bacteria was passed in this way), and as defaecation occurs only at long intervals, and not as a rule during feeding, it seems very improbable that *A. persicus* could be an efficient vector of any of the bacteria experimented with. To test the possibility of *A. persicus* transmitting anthrax, several ticks harbouring *B. anthracis* were fed on a guineapig, but no infection resulted.

DONISTHORPE (H.). **Insects in the Nest of the Grey Squirrel.**—*Ent. Record Jl. Var.*, xxxvii, no. 11, p. 163. London, 15th November 1925.

The insects recorded in nests of the grey squirrel include *Ceratophyllus wickhami*, Baker, recorded for the first time from Britain. In North America this flea is a well-known parasite of this host.

SCOTT (H.). **Zoo-geographical and Systematic Notes on the Nycteribiidae (Diptera Pupipara) of India, Ceylon and Burma.**—*Rec. Ind. Mus.*, xxvii, pt. 5, pp. 351–384, 12 figs. Calcutta, September 1925.

The contents of this paper are indicated by its title. Tables are given showing the distribution of all the Nycteribiids known to occur in the region named, and of the bats that they infest.

HOH (L.). **An Eye Nematode in Chickens.**—*Lingnaam Agric. Rev.*, iii, no. 1, pp. 14–15. Canton, China, 19th October 1925.

Chickens with the eyelids swollen so as to cause complete blindness were found to be infested with Nematodes, probably *Filaria mansoni*. If this identification proves to be correct, the Chinese saying that a mosquito-bite causes blindness in chickens may have some truth in it.

D'EMMEREZ DE CHARMOY (D.) & MOUTIA (A.). **Hints on the General Treatment of Insect Pests in Mauritius.**—*Dept. Agric. Mauritius*, Gen. Ser. Bull. 31, 16 pp., 1 pl. Port Louis, 1925.

This is a summary of information on methods of controlling insect pests, including those attacking man and domestic animals. Numerous formulae are given, with directions for their use, including baits for house-flies and repellents for flies infesting cattle.

Backus (L. S.). **Common Parasites of Farm Animals, their Prevention and Treatment.**—*Missouri Agric. Expt. Sta.*, Circ. 134, 16 pp., 1 fig. Columbia, Mo., April 1925. [Recd. November 1925.]

This circular includes short popular accounts of some of the chief Arthropod pests of domestic animals, with directions for their control.

Hardy (G. H.). **The Fecundity of *Mormoniella* and some Problems in Parthenogenesis.**—*Queensland Agric. Jl.*, xxiv, pt. 4, pp. 347–348. Brisbane, 1st October 1925.

The author has followed up his experiments with *Mormoniella* [*brevicornis*, Ashm.] [*R.A.E.*, B, xiii, 21] and has found that the number of eggs laid by one female, and the number of puparia of blow-flies [*Lucilia*] parasitised are considerably greater than has been stated by Johnston & Tiegs [*R.A.E.*, B, x, 134]. On account of the minute size of the eggs of the Chalcid and the comparatively large size of the blow-fly puparia, the only method of estimating the progeny of the former is by rearing the adults. In experiments carried out under conditions not especially favourable to the Chalcid, the number of adults reared from the eggs of one *Mormoniella* varied from 156 to 400, not less than 35 blow-fly puparia being killed by the progeny of each parent parasite. Subsequently, using puparia of the most suitable age, and taking care that not too many eggs were deposited in any one, the progeny of one female *Mormoniella* amounted to 550 adults reared from 86 blow-fly puparia. The statement of Johnston & Tiegs that unfertilised females of *Mormoniella* produce only males is confirmed; 288 males, the progeny of one virgin female, were reared from 57 puparia. As the proportion of the sexes in *Mormoniella* is believed to be approximately equal, and as the females live much longer than the males, the author advances the theory that there are male eggs and female eggs, the former being fertile, and the latter requiring fertilisation by the male to produce germination; further, that one pairing is probably not sufficient to render all the female eggs fertile, and that polyandry occurs. If this is the case, it is obvious that the production of males by unfertilised females is of benefit to the species.

Smith (B.). **Sheep Blow-fly Control: A New Method.**—*Jl. Dept. Agric. Union S. Africa*, xi, no. 5, pp. 455–458, 1 fig. Pretoria, November 1925.

The trap described is built of two six-foot pieces of corrugated iron. These are bolted together and then bent into a trough with the ends open, the top edges being bent inwards to prevent the escape of the maggots. It is hung by wire between four fencing poles so that the open ends are directly over paraffin tins. These have the tops cut open, leaving a rim of about half an inch inside the top. They are kept in place by banking the soil around them. All carcasses are thrown into the trough, they attract various blow-flies (*Lucilia sericata*, Mg., *Chrysomyia albiceps*, Wied., and *C. chloropyga*, Wied.) and are soon swarming with maggots. When mature, the maggots crawl away from the carcase and fall into the paraffin tins, where they are destroyed by pouring a little water and paraffin over them. The possibility of preserving the maggots as poultry food is suggested.

Kröber (O.). **Egyptian Tabanidae.**—*Bull. Soc. R. ent. Egypte*, xviii, pt. 1–3, pp. 77–137, 22 figs. Cairo, 1925.

A list is given of 100 species and varieties belonging to 16 genera or subgenera of Tabanids, all of which occur in the various countries of North Africa. Of these 5 genera or subgenera comprising 14 species occur in Egypt. Species here recorded as new to Egypt are *Tabanus* (*Atylotus*) *lunatus*, F., *T. gratus*, Lw., *Tabanus* sp. near *glaucopis*, Mg., *Ochrops pulchellus*, Lw., *O. farinosus*, Szil., and *Ochrops* sp. near *grisescens*, Szil.

Isaac (P. V.). **Papers on Indian Tabanidae, VIII. The Bionomics and Life-histories of some of the Common Tabanidae of Pusa.**—*Mem. Dept. Agric. India*, Ent. Ser., ix, no. 2, pp. 21–28, 6 pls. Calcutta, June 1925. [Recd. November 1925.]

The species dealt with in this paper are *Tabanus macer*, Big. (*bicallosus*, Ric.), *T. rubidus*, Wied. (*albimedius*, Wlk.), *T. tenens*, Wlk. (*striatus*, auct. nec F.), *T. virgo*, Wied., *T. nemocallosus*, Ric., and *Gastroxides ater*, Saunders. The eggs and egg-masses, larvae, pupae, and adults of all the above species are briefly described and illustrated, with the exception of the eggs and early stage larvae of *T. virgo* and *G. ater*, which were not found. The bionomics of the species of *Tabanus* are in the main similar to those of *T. crassus*, Wlk., and *T. striatus*, F. [*R.A.E.*, B, xiii, 4, 166], and the habits of several of them have been noted elsewhere [*R.A.E.*, B, v, 38; vi, 63; x, 67; xii, 47; etc.]. The eggs are laid in masses on twigs and leaves over water, those of *T. nemocallosus* being laid over shallow water along river banks [but *cf. R.A.E.*, B, vi, 63]. The eggs hatch usually in about 4 days, those of *T. rubidus* and *T. tenens* always hatching in the early morning. The second stage larvae of *T. macer* and *T. nemocallosus* are unable to float, but those of *T. rubidus* and *T. tenens* have large tracheae and are able to do so. The length of the larval stage is usually 4 to 6 weeks, but extends to 16 weeks in the cold season, when hibernation takes place. The larvae live in the damp soil beside water, and feed on soil organisms; they are mostly also cannibals and are able to withstand long periods of starvation, so that if there is a shortage of food it is possible that the adults may emerge at irregular times. In all the cases observed the first instar larva has no mouth-parts and moults very soon after dropping into the water. There are seven larval instars in *T. macer*, *T. rubidus* and *T. tenens*. The larvae of *T. nemocallosus* are found about 2 feet away from water, generally in hard, caked, damp earth, 3 or 4 inches below the surface; they are not cannibals, and in captivity refused to feed on earthworms or Dipterous larvae and could not be reared. The larvae of *T. rubidus* live in damp earth sometimes below the surface of the adjacent water, being kept from drowning by their tracheal system. The pupae occur in the larval habitats, usually nearer the surface than the larvae, the pupal stage lasting from 5 to 10 days in the various species. There are three generations a year, emergence of the adults and oviposition taking place in March and April, July, and October and November. The females of all of them suck the blood of cattle; *T. macer* and *T. rubidus* are most active in bright sunshine, while *T. tenens* feeds at sunset; the females, and occasionally the males of the last species, which is the most abundant at Pusa, may be seen on shaded tree-trunks and walls.

The larvae of *Gastroxides* are found in the humus, etc., in tree-holes and apparently feed on the organisms occurring there. The pupae occur in the larval habitat, and the pupal stage lasts six days. The adults emerge in June and July. The mouth-parts of the female are apparently adapted for piercing and sucking. There is only one generation a year, and hibernation takes place in the larval stage; larval growth is very slow.

GREENE (C. T.). U.S. Bur. Ent. **A Tentative Arrangement of the Muscoid Flies based on the Puparia.**—*Proc. Ent. Soc. Wash.*, xxvii, no. 8, pp. 157–163, 1 pl., 2 refs. Washington, D.C., November 1925.

This grouping of the Muscoid flies is based on a study of about 400 species, which are divided into the families TACHINIDAE, DEXIIDAE, SARCOPHAGIDAE, OESTRIDAE, CALLIPHORIDAE and MUSCIDAE including ANTHOMYIIDAE. The principal adult character used is the arista of the antenna, whereas that of the puparium is the posterior spiracular plate. Both these characters appear to be constant for a species, while the characters of the puparia allow of a satisfactory division into family groups and species, but are not suitable for defining genera. A few heterogeneous groups between the family and species can be defined, but from this study of the puparia it would seem probable that too many genera have been made for the adults. In some cases the characters of the larvae are also described, and a brief outline of their habits is given under each family.

The Oestrids are divided into three groups as follows:—Group A, which contains *Cephalomyia* (*Oestrus*) *ovis*, L.; *Cephenomyia macrotis*, Brauer, and *C. cooki*, Towns., the larvae of which occur in the throats of *Cervus macrotis* and pigs, respectively; *Hypoderma lineatum*, Vill.; *Oedemagena tarandi*, L.; *Rhinoestrus nivarleti*, R. & B., the larvae occurring in the sinuses of a wild pig (*Potomachoerus porcus*) in Africa; *Oestrus* (*Gastrophilus*) *intestinalis*, DeG. (*equi*, Clark); *O.* (*G.*) *haemorrhoidalis*, L.; and *O.* (*G.*) *nasalis*, L. Group B, containing *Cuterebra americana*, F., a parasite of the jack rabbit; *C. buccata*, Macq., parasitic on the striped squirrel and cats and in the throat of *Neotoma* sp.; *C. cuniculi*, Clark, occurring in the skin of dogs, hares, rabbits, and mice; and *C. baeri*, Shannon & Greene, infesting the red howling monkey (*Alouatta* sp.) in Central and South America. Group C, represented by *Dermatobia hominis*, L., the larvae occurring under the skin of man, monkeys and dogs.

PATTON (W. S.) & COOKSON (H. A.). **Cutaneous Myiasis in Man caused by** *Musca domestica*.—*Lancet*, 20th June 1925, p. 1291, 1 fig. London, 1925. [Recd. December 1925.]

The case described was a man over 80 with varicose veins of the lower extremities and the dermatitis associated with these. Maggots of *Musca domestica* were noticed in large numbers on the patient's leg, and it is believed that all the larvae issued from eggs laid by a single female in the vicinity of a small ulcerous cavity, but being in an unsuitable medium they came to the surface. Some of them had reached the third stage, but were small and undeveloped, though they had been in the tissues of the leg for weeks. The infestation caused no inconvenience to the patient.

HERMS (W. B.). **Ophthalmomyiasis in Man due to** *Cephalomyia* (*Oestrus*) *ovis* **(Linn.).**—*Jl. Parasit.*, xii, no. 1, pp. 54–56, 1 fig., 4 refs. Urbana, Ill., September 1925.

Two first stage larvae of *Cephalomyia ovis*, L., were removed from the eye of a labourer in Honolulu. A brief résumé of the habits and life-history of *C. ovis* in Honolulu is given; the fly is probably active throughout the year.

BRAUN (M.). **Naturgeschichte der tierischen Parasiten des Menschen.** (BRAUN, M., and SEIFERT, O. **Die tierischen Parasiten des Menschen. Die von ihnen hervorgerufenen Erkrankungen und ihre Heilung. Erster Teil.**) [The Life-histories of the Animal Parasites of Man. (BRAUN and SEIFERT. The Animal Parasites of Man. The Diseases caused by them and their Cure. First Part.)]—6th enl. & revd. edn., x+608 pp., 416 figs. Leipzig, Curt Kabitzsch, 1925. Price *Mks.* 19.50 paper, *Mks.* 21.60 bound.

This work discusses the various forms of parasitism and parasites, the latter being dealt with in their various groups including mites and insects. Sufficient characters are given to enable the different Arthropods dealt with to be recognised, with occasional brief notes on the life-history, though the latter are not always given for the more important species. There is a bibliography of 105 pages of which 15 are devoted to Arthropods, giving full references to the originals cited in the text.

BRUCE (E. A.). **Tick Paralysis.**—*Jl. Amer. Vet. Med. Assoc.*, lxviii, no. 2, pp. 147–161, 1 pl., 20 refs. Detroit, Mich., November 1925.

This is a discussion of the known facts regarding tick paralysis in man, sheep, and sometimes in dogs and cattle, caused by attacks of *Dermacentor venustus*, Banks, with particular reference to British Columbia [*cf. R.A.E.*, B, x, 198]. No case of either spotted fever or tularemia has as yet been recorded from Canada. The question of immunity from paralysis is not definitely settled, but age appears to be a factor in man. A single tick may cause paralysis, and in all such cases the infective agent seems to be a rapidly engorging female. Assuming that paralysis is caused by a toxin produced while feeding, it would seem that either it is only when the tick is engorging fast that the toxin is produced, or that it is only then that the toxin is injected into the body in quantities too great to be accommodated in a given time. In all human cases there is an engorging female tick present, and in sheep, when the engorging female ticks are removed, recovery from the paralysis follows even when other ticks remain. Although the occurrence of tick paralysis in sheep depends partly on the abundance of *D. venustus*, it is thought to be also dependent on the condition of the animals and climatic conditions.

PANISSET (L.). **Une maladie nouvelle : la piroplasmose des Equidés.**—*Vie agric. & rur.*, xxvii, no. 48, p. 345. Paris, 28th November 1925.

Although bovine piroplasmosis has been previously known in France [*R.A.E.*, B, viii, 19], it is only recently that cases of piroplasmosis in horses have been recorded, from Loire-Inferieure and from Haute-Marne. It is thought that this disease is frequently confused with

anaemia in horses, as it is not very easy to diagnose. The removal of ticks from the animals by hand or by brushing is a sure method of prevention, and in cases of severe infestation the remedies previously suggested [*loc. cit.*] are recommended.

CHRISTOPHERS (S. R.), SHORTT (H. E.) & BARRAUD (P. J.). **Further Observations on the Feeding of Sandflies,** *Phlebotomus argentipes*, **on Cases of Indian Kala-azar.**—*Ind. Jl. Med. Res.*, xiii, no. 1, pp. 159–165. Calcutta, July 1925. [Recd. November 1925.]

Feeding experiments with *Phlebotomus argentipes* on kala-azar patients [*R.A.E.*, B, xiii, 79] have been continued in Assam, both with captured individuals and those bred in the laboratory. Though the sandflies were taken in numbers both before and after February, none were caught in that month, with the exception of 3 males. Of the flies taken before the interval, which was due to cold weather, a large proportion fed, whereas of those taken after it, only a very few did so. This was probably because they had only freshly emerged, while those previously dealt with were older. The flies bred from eggs in the incubator at 27° C. [80·6° F.] began to emerge on 12th January and continued to do so until the supply was exhausted on 12th March. The details of the feeding experiments are given, their primary object being to follow up the further development of the flagellates. The infections proved to be progressively heavier with the increased time after feeding, up to the fifth day. The majority of the flies, whether captured or bred, did not survive any longer. In a few cases it was possible to keep them alive to the sixth or seventh day by refeeding, but all these proved negative when examined for flagellates. In flies examined on the third day or earlier, the appearances are those of early cultural development, whereas by the fourth or fifth day they resemble those in the more mature cultures. A close study of these flagellates has not revealed any morphological character differentiating them from the flagellate phase of *Leishmania*. The similarity extends to minute peculiarities in the nuclear structure and to an identity with certain definite types of forms that have recently been classified and defined in cultures. The most noticeable feature of the present investigations has been the very heavy infections found (sometimes several hundreds of flagellates) in a number of the fifth day flies; in these flies infection is usually either intense or entirely absent. A large number of the flagellates are attached by their flagella to the gut wall. In light infections the flagellates are usually single free-swimming forms that may occur in any part of the mid-gut. In the heavier infections many free forms may be found in the intestine, but no special rectal forms have been noticed. Large numbers may be found on the pouch that is anterior to the mid-gut, and considerable development of the parasite frequently occurs in this position.

Since writing the above, the authors have dissected a fifth day sandfly fed on a case of kala-azar, in which flagellates extended forward into the hinder end of the pharynx. There was a heavy flagellate infection of the mid-gut, and a noticeably dense growth of flagellates forming a palisade-like mass in optical section on the proventriculus. Flagellates were seen extending through the proventricular opening and were present in considerable numbers apparently attached to the membranous oesophagus. They also occurred within the pharynx (pumping organ) for a short distance beyond the posterior end, being present in the part of the organ that shows a characteristic crinkly appearance

due to circularly arranged chitinous ridges and teeth. One form was attached by its flagellum to the membrane on the anterior surface of one of the maxillae, but whether this had attached itself before or after dissection is uncertain. In one other sandfly dissected on the sixth day, 3 flagellates were seen attached by their flagella in an exactly similar situation. In this case several flagellates were also detected in the loose membrane of the labium. The latter results are suggestive, but cannot be given too much weight, as the forms may have been liberated in dissection and fixed themselves to the parts subsequently. The infection of the pharynx was not open to any such doubt, as the flagellates were seen *in situ* before a coverglass had been placed on the preparation and while the complete alimentary canal was intact.

CHRISTOPHERS (S. R.), SHORTT (H. E.) & BARRAUD (P. J.). ***Culicoides* and Kala-azar in Assam.**—*Ind. Jl. Med. Res.*, xiii, no. 1, pp. 175–176, 2 refs. Calcutta, July 1925. [Recd. November 1925.]

The midges of the genus *Culicoides* are especially associated with the damp and humid conditions characteristic of the chief kala-azar areas in India and have therefore been suspected as possible carriers of the disease. Among some 12 species occurring at Golaghat, Assam, where kala-azar is widely spread in the villages, the following have so far been identified:—*C. macrostoma*, Kieff., *C. oxystoma*, Kieff., *C. peregrinus*, Kieff., and *C. anophelis*, Edw. Of these only *C. macrostoma* has been found to bite man, and it especially attacks the ears. *Phlebotomus argentipes*, Annan. & Brun., is seldom seen in this part of Assam. Large numbers of *C. macrostoma* could be obtained by catching them when attempting to feed. They would feed readily on kala-azar cases, but the mortality among the fed flies was very heavy when kept under artificial conditions. Of 193 flies only 48 survived to the third day, *i.e.*, 72 hours after feeding. Two flies remained alive until the fourth day. All dissections proved negative, whereas *P. argentipes* fed on the same cases gave positive results.

STRICKLAND (C.). **The Mosquito Factor in the Malaria of Assam Tea Gardens.**—*Ind. Med. Gaz.*, lx, no. 11, pp. 514–524, 15 figs., 9 refs. Calcutta, November 1925.

Of the 42 species of Anophelines occurring in India and Malaya, 15 have been found in Assam. Six of these are considered more or less dangerous with regard to malaria, though others may ultimately prove also to be carriers. A survey of the tea gardens has led the author to conclude that *Anopheles funestus*, Giles (under which the author includes *minimus*, Theo., and *listoni*, List.) and *A. aconitus*, Dön., associated with rice-fields, are very dangerous; that probably during the rains, *A. culicifacies*, Giles, breeding in pools of pure water, is also a source of danger; that *A. maculatus*, Theo., breeding in spring-water, cannot on present evidence be considered very injurious; that *A. umbrosus*, Theo., lurking in all undrained jungle, should be regarded with great suspicion; and that *A. jeyporensis*, Theo., is of very little importance as a carrier.

Measures of general application that can be utilised in an anti-mosquito campaign are reviewed; these include sterilising the blood of parasite-carriers, especially when these are children; quinine has certain limitations in this respect, and it is hoped to discover some more effective preventive. Protection from mosquitos

by means of screening is strongly advocated, as well as the cleaning up of all pieces of water and keeping them in good condition. The survey has revealed many difficulties in the way of anti-mosquito measures owing to so many of these, such as oiling and flooding, being incompatible with rice-growing. It seems as though, so long as rice-cultivation continues, a mitigation of the malarial prevalence is the best that can be hoped for. In this connection, certain ameliorations in the local methods of rice-growing are suggested. While it is frequently impracticable and expensive to move existing houses, lines, etc., to a more healthy situation, whenever new habitations are being built, the site should be chosen carefully under the supervision of a medical officer.

YAMADA (S.). **A Revision of the Adult Anopheline Mosquitoes of Japan : Systematic Descriptions, their Habits and their Relations to Human Diseases, together with an Account of Three New Species.** —*Sci. Repts. Govt. Inst. Infect. Dis.* iii, 1924, pp. 215–241. Tokyo [1925].

There are 13 species of Anophelines in Japan, including three new ones ; they all belong to two subgenera, *Anopheles* and *Myzomyia*, and these have a distinct distribution. *Anopheles* extends all over the Japanese Empire, but *Myzomyia* is entirely confined to Formosa and Ryukyu Islands, not a single species having been recorded from Japan proper or from Korea. The distribution of *Myzomyia* is bounded by the frost line as is that of *Aëdes argenteus*, Poir.

Only the first part of the paper is published here. It contains a tabulated list of the species, with their synonyms, distribution and relation to human disease. They are *Anopheles japonicus*, Yam. (*pleccau*, Koidzumi), *A. hyrcanus*, Pall. (*sinensis*, Wied.), *A. sineroides*, sp. n., *A. koreicus*, Yam. & Watanabe (*punctibasis*, Edw.), *A. edwardsi*, sp. n., *A.* (*Myzomyia*) *minimus*, Theo., *A.* (*M.*) *formosaensis*, Tsuzuki, *A.* (*M.*) *hatorii*, Koidzumi, *A.* (*M.*) *fuliginosus*, Giles, *A.* (*M.*) *hanabusai*, sp. n., *A.* (*M.*) *indiensis*, Theo. (*splendidus*, Koidzumi), *A.* (*M.*) *tessellatus*, Theo., and *A.* (*M.*) *kochi*, Dön.

In the instalment of the paper under review only the first five are dealt with. Though *A. japonicus* bites man, there is no evidence of its having any relation to disease. It has been found breeding in mountain springs. The female of *A. hyrcanus* bites human beings at night and in darkness, and both sexes enter houses. Only the female hibernates. Larvae have been found in somewhat large ponds, permanent pools, marshes, rice-fields, ditches having a slow current and temporary pools in deltas of large rivers. They have also been found in a small concrete basin in a garden and in a wooden water barrel. Breeding is continuous from spring to autumn, and there are at least 5 or 6 generations during the warm season. The number of adults is at a maximum in July. Towards the end of autumn, breeding decreases, but larvae, pupae and adults of both sexes are seen even in November. One female is recorded as biting on the 10th November at a temperature of 10° C. [50° F.]. The average longevity of females experimentally was 16 days and of the males 13 days. One female was kept alive 12 days after it laid eggs, and another 11 days. This species is an important carrier of *Plasmodium vivax* and is responsible for the prevalence of benign tertian malaria in the villages from Formosa to Hokkaido and also in Korea. According to the author's and other records this species is capable of acting to a certain extent as

an intermediate host of *Filaria bancrofti*, but it is not such an important carrier as *Culex pipiens*, L., var. *pallens*, Coq., and *Aëdes togoi*, Theo. The author has examined the type of *A. sinensis*, Wied., that of *Culex hyrcanus*, Pall., being lost, and concludes that the typical or Caspian form should be called *Anopheles hyrcanus hyrcanus*, and the Chinese form, *A. hyrcanus sinensis*.

A. sineroides is described from Japan. The females feed on human blood. *A. koreicus* has been reared from pupae found in a muddy shaded pool in company with *Culex hyashii*, Yam. *A. edwardsi* is described from near Tokyo, from females found under the roof of a cottage where they seemed to have passed the winter. They readily bite in darkness. There is no evidence that any of these three species has any relation to disease.

KIRKPATRICK (T. W.). **The Mosquitoes of Egypt.**—*Egypt. Govt., Anti-Malaria Commiss.*, 224 pp., 31 pls., 2 maps. Cairo, 1925. Price, P.T. 30.

This monograph is the result of a year's survey of the mosquito fauna of Egypt, in which the Delta, the Faiyum and the Nile Valley were particularly studied ; it is hoped before long to study the desert regions in the same detail. During the year, six species hitherto unrecorded in Egypt have been added to the list, including three that were found to be new to science [*R.A.E.*, B, xiii, 125]. These bring the total to 22 species, of which the larvae and pupae are described and figured. The systematics of mosquitos in general are discussed, with special reference to the Egyptian ones. A discussion of the geographical and climatic conditions of Egypt shows that the environment is not, on the whole, favourable to mosquito breeding, the isolation of the country by barren deserts being undoubtedly the reason for the small number of species found there. The distribution, seasonal prevalence, ecology and biology of the species that occur in Egypt are dealt with. The author considers that mosquitos are not a necessary concomitant of agriculture as practised in Egypt, the only exceptions being in the sparsely cultivated areas of low-lying salt land, where pools are often present throughout the year, and the areas of rice cultivation. The former could be dealt with by efficient drainage, which would also bring large new tracts under cultivation ; with regard to the latter, it is important to know whether *Anopheles pharoensis* will prove to be a malaria carrier.

Tables are given showing the distribution of mosquitos in Egypt and the association with each other of the larvae of different species. Notes are given in an addendum on the mosquitos of the Oasis of Baharia and of Central Sinai.

CATANEI (A.). **Anophèles de hautes régions de la Corse. Présence d'***A. bifurcatus*, **L., et d'***A. plumbeus*, **H. et S., dans l'île.**—*Bull. Soc. Path. exot.*, xviii, no. 8, pp. 655–659, 1 ref. Paris, 1925.

Anophelines collected in Corsica in 1925 comprised *Anopheles algeriensis*, Theo., *A. maculipennis*, Mg., *A. plumbeus*, Hal., and *A. bifurcatus*, L., the last two being recorded for the first time from the island. *A. bifurcatus* is the commonest species at the higher altitudes, at which *A. maculipennis* occurs more rarely. Breeding-places of these species occur throughout the island, though indigenous malaria is unknown except at Corte.

In a note to this paper by E. Brumpt, it is stated that *A. maculipennis* is replaced by *A. bifurcatus* at altitudes from about 1,000 to over 3,000 ft. The latter is apparently limited by two factors, the low temperature and acidity of the water. The larvae cannot exist in water that has a pH value lower than 5·4 or 5·2. At the higher altitudes the alkaline waters of the plains become neutralised or even acid. *Culex* spp. can withstand greater acidity and occur at elevations of almost 6,000 ft. The majority of the breeding-places of *A. bifurcatus* are essentially of a temporary character. They are always in the vicinity of running water, in the river beds, etc., and are washed away at the slightest floods.

The Anophelines recorded from the eastern plain of the island are *A. maculipennis, A. algeriensis, A. hyrcanus,* Pall., and (?) *A. elutus,* Edw.

COLAS-BELCOUR (J.). **Sur les Anophélines en Basse-Normandie.**—*Bull. Soc. Path. exot.*, xviii, no. 8, pp. 659–660, 7 refs. Paris, 1925.

Anopheles plumbeus, Hal., *A. maculipennis,* Mg., and *A. bifurcatus,* L., are recorded, this being apparently the first record of *A. plumbeus* from this region. A large number of larvae and pupae were taken from a collection of water in a crack of an oak stump in company with *Culex pipiens,* L., and *Aëdes* (*Ochlerotatus*) *geniculatus,* Ol. The last was exceedingly abundant in August. *A. maculipennis* is very common throughout Normandy and occurred both in fresh water and in brackish water in which the sodium chloride amounted to 4·12 gms. per litre. This amount of salt in no way interfered with the development of the larvae.

ALESSANDRINI (G.). **Lo studio biologico della risaia.** [The biological Study of the Rice-field.]—Extract, 33 pp., 6 figs., from "La Risicoltura e la Malaria nelle zone risicole d'Italia," Rome, Minist. Interno e Economia Nazionale, 1925. (Abstract in *Ann. d'Igiene,* xxxv, no. 10, pp. 912–914. Rome, October 1925.)

Careful observation shows that Anophelines in some non-malarial rice-growing districts of Italy are more vigorous than those from marshy areas, and the author concludes that they therefore resist malarial infection and cease to be vectors, this being considered to explain the occurrence of *Anopheles* without malaria. Details are given to show that measurements of the larvae from rice-fields are larger (except in the head) than those from marshes, and that there are constitutional differences also. The former larvae have an abundant fat-body and their tissues are tough, so that dissection is easy, while in 90 per cent. of larvae from marshes the gut breaks when an attempt is made to extract it. Owing to the richness of chlorophyll in the algae in rice-fields, the larvae are a brilliant green when examined by transmitted light, whereas those from marshes are of a brownish colour. The larvae have a decided preference for algae rich in chlorophyll, and this is correlated with a true phototropism for green. For this reason Paris green is a most effective larvicide and is superior to other insoluble poisons used in the same way. Marsh larvae have to feed on protozoa and bacteria. The protozoa resist digestive action, and the larvae are feeble owing to lack of food. The difference between the two types of larvae is increased by other factors, such as the toxic effect of the products of decomposition that occur in marshes. Marsh water is also poor in dissolved oxygen, so that the larvae expend much energy in constant journeys to the surface.

Rice-fields offer conditions very favourable to the larvae. The draining periods last only 7–8 days, so that complete dryness does not occur, and the adults find food in the animal quarters and dwellings near by. These vigorous Anophelines evidently have digestive secretions capable of destroying the malaria gametes ingested with blood-meals. In the province of Ravenna the author found an abundance of mosquitos (*A. maculipennis*, with smaller numbers of *A. superpictus*, *A. hyrcanus* (*pseudopictus*) and *A. bifurcatus*), and measures are taken against them, but only because of the annoyance caused by their bites and not because of any risk of malaria. Conditions similar to those found in rice fields occur in many areas that have been drained. Anophelines have sometimes increased, but malaria has disappeared.

FALLERONI (D.). **L'anofelismo delle risaie nelle Paludi Pontine, in relazione all'epidemiologia della malaria.** [The Anophelism of the Rice-fields in the Pontine Marshes in Relation to the Epidemiology of Malaria.]—*Il Policlinico*, Sez. pratica xxxii, no. 40, pp. 1394–1396. Rome, 5th October 1925. (Abstract in *Ann. d'Igiene*, xxxv, no. 10, p. 915. Rome, October 1925.)

This paper suggests a different interpretation of the presence of Anophelines in rice-fields in the absence of malaria from that in the preceding one.

The differences distinguishing the two forms of the eggs of *Anopheles maculipennis* in the Pontine marshes [*R.A.E.*, B, xiii, 81] correspond to differences in the adults. The black eggs yield adults of larger size, with more pronounced wing-spots and with larger and darker limbs. These adults deposit fewer eggs than those that lay grey eggs, the averages being 177 and 223.

There are also eggs with two black bands and with a marked grey incrustation ; these the author formerly included in the class of grey eggs, but he here places them in the other class. Grey eggs predominated (83·55 per cent.) in a rice-field recently established in the Pontine marshes, whereas in another locality in the same region the black eggs predominated (87·52 per cent.). It is thought that the smaller degree of malaria in the rice-growing zone is correlated with this, and it is suggested that the race with grey eggs tends to become localised in rice-fields and that it is comparatively resistant to malaria. Apart from rice-fields, Anophelines with black eggs predominate in localities where severe malaria occurs. There is also a difference in the abundance of the two types in the course of the year, and this corresponds with the varying incidence of malaria at different seasons.

ROUBAUD (E.). [**Commentary on a Statement by Falleroni.**]—*Bull. Inst. Pasteur*, xxiii, no. 2, p. 88. Paris, 15th January 1925. [Recd. December 1925.]

In abstracting a paper by Falleroni on *Anopheles maculipennis* [*R.A.E.*, B, xiii, 81] Roubaud disputes Falleroni's conclusion that the hypertrophy of the malpighian tubes is not connected with hibernation, and points out that there is a decrease of ovipositing females in winter irrespective of temperature, and that all individuals taken in winter are not hibernating in the strict physiological sense ; some of them can immediately regain a normal fecundity with a rise of temperature. Moreover, those that are truly hibernating are not all at the same stage of reactivation at a given moment.

HACKETT (L. W.). **The Importance and Uses of Paris Green (Copper Aceto Arsenite) as an *Anopheles* Larvicide.**—*Staz. sperim. per la Lotta antimalarica, Roma.* 15 pp., 4 figs. Rome, 1925.

This paper was read at the first international congress on malaria, held at Rome. Previous work on the subject is briefly reviewed, and experiments in Italy in 1924–25 are described in detail. Paris green was found to be a very successful larvicide against Anophelines, being particularly useful on water surfaces covered with algae and obstructed with thick vertical vegetation ; other advantages are its cheapness and portability, its harmlessness to other forms of aquatic life and to domestic animals, the fact that it does not render water unfit for domestic uses and the simplicity of its application. Its disadvantage lies in the fact that it does not affect eggs or pupae of *Anopheles* or any of the aquatic stages of Culicine mosquitos. Experiments in Italy proved that at the rate of 1 cc. to 10 sq. metres of water surface, Paris green killed all Anopheline larvae present, regardless of the amount or density of algae or marginal vegetation and of whether the water was standing or flowing. This amount was innocuous to all other forms of life. The cost of applying Paris green in Italy did not exceed 10·20 lire per 1,000 sq. metres of water surface. Road dust was found to be the best and cheapest carrier for Paris green ; it should be screened and stored under cover in large quantities, as only a very dry dust can be used. Wood ashes, spoiled flour, lime, fine sand and cork dust can be used as substitutes. Mixing should be done in a tight box or small barrel through which an iron pipe has been run diagonally and which can be revolved like a concrete-mixer. Distribution should be by hand, throwing the mixture in the air so that the wind will carry the dust cloud over the surface of the water. It is almost impossible to distribute a 1 per cent. dust too lightly by hand, unless the water is covered with scum, when a larger amount may be necessary. For quite small areas, a hand blower or bellows as used to dust vines is more satisfactory. The distributors should take care to keep to windward of the dust cloud, and to change the outer clothing and wash the hands before eating.

PERYASSÚ (A.). *Anopheles alagoanii* **(n. sp.) Peryassú.**—*A Folha medica*, vi, no. 22, pp. 258–259. Rio de Janeiro, 16th November 1925.

Anopheles alagoanii, sp. n., is described from specimens taken from June to September in the State of Alagôas, Brazil. The larvae are found in ditches and half submerged marshes.

GAGE (E. H.). **Studies of Impounded Waters in relation to Malaria.**—*Pub. Health Repts.*, xl, no. 42, pp. 2211–2219, 2 refs. Washington, D.C., 16th October 1925.

The last impounding of waters in Horse Creek Valley, South Carolina, occurred in 1907, and malarial conditions there seem to have greatly improved during the last 10 or 15 years. The improvement apparently began at about the time of the installation of piped water supplies, when the dug wells were filled, and it has generally been believed that good water is the cause of it. Inspections during January-October 1924 showed the surprising result of many less larvae and pupae of

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Anopheles being collected from the impounded waters, where conditions seemed favourable for breeding, than from other production areas, such as seepage areas and roadside and railroad ditches. Of the mosquitos emerging, *A. crucians* was always largely in the majority, except in May, when *A. punctipennis* predominated in areas other than those of the impounded waters. *A. quadrimaculatus* was also found. A certain amount of oiling was done in some of the mill villages, but there was no concerted effort for mosquito control, and malaria is not now considered to be of any importance in the locality.

KUDO (R.). **Studies on Microsporidia parasitic in Mosquitoes. IV. Observations upon the Microsporidia found in the Mosquitoes of Georgia, U.S.A.**—*Centralbl. Bakt., Paras. Infekt.*, Ite Abt. Orig., xcvi, no. 7–8, pp. 428–440, 2 pls., 7 refs. Jena, 25th November 1925.

Of 1,450 Anopheline larvae in Georgia, 4·5 per cent. were infected with *Thelahonia legeri*, *T. obesa*, sp. n., *T. pyriformis*, sp. n., and *Nosema anophelis*, sp. n. Infection increases with the increase of larvae in a limited area and with certain conditions of growth of algae. One wild engorged *Anopheles quadrimaculatus* was lightly infected with *N. anophelis*, which was also found in two larvae. Four adult *A. quadrimaculatus* bred in the laboratory were infected with *T. legeri*, indicating that a moderate infection does not prevent the larva from completing its metamorphosis. Infection of the eggs was not observed. *T. legeri* was seen in 54 larvae, of which 30 seemed to be infected very heavily. The larvae become infected *per os*.

Microsporidia parasitic in Culicines are *Thelohania opacita* from an unidentified larva ; and *T. rotunda*, sp. n., and *T. minuta*, sp. n., from the larvae of *Culex leprincei*.

DE VERTEUIL (E.). **Some Observations on Malignant Tertian Malaria in Trinidad, B.W.I.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xix, no. 4, pp. 235–239, 2 refs. London, December 1925.

Of the Anophelines occurring in Trinidad the only likely malaria carriers are apparently *Anopheles tarsimaculatus*, *A. albimanus*, *A. argyritarsis* and *A. maculipes*. There is little doubt that the first two, which form about 80–90 per cent. of the Anophelines in the most populated parts of the island, are the usual carriers of benign tertian and quartan malaria. In the case of malignant tertian, however, observations extending over a number of years indicate that one of the last two or both are the usual carriers. Together they represent about 5 to 10 per cent. of the Anophelines and occur in most parts of the island. Malignant tertian malaria is strictly confined to certain localities, even certain houses ; it occurs yearly about 4 to 6 weeks after the beginning of the benign tertian and quartan epidemics, and is generally prevalent during July, August and September. It disappears rapidly from a locality when the undergrowth is cleared, but there is no apparent concomitant reduction in the numbers of *A. tarsimaculatus* and *A. albimanus*. Only 13 cases of malignant tertian malaria with pernicious symptoms for investigation could be found ; in all these cases pigs were being reared within from 10 to 50 yards of the infected person. Larvae of *A. maculipes* were found in some of the mud pools and puddles near these animals. Two of the pigs were

inoculated with blood from the patient's arm, but subsequent examination of slides taken from these and the non-inoculated pigs were all negative. Should it be proved that *A. maculipes* breeds in the mud pools and puddles formed by the pigs and that it is able to transmit malignant tertian malaria, it would largely account for the predominance of the disease a few weeks after the beginning of the rainy season.

SHARP (N. A. D.). **Epidemic Disease in West Africa. The Menace of the Future.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xix, no. 4, pp. 256–264, 3 figs., 1 map. London, December 1925.

The recent introduction of louse-borne recurrent fever into West Africa seems to be likely to be fraught with grave and far-reaching consequences. On virgin soil it appears to exhibit a malignancy out of proportion to its comparatively harmless nature in countries where it has long been endemic. Nothing in the nature of an epidemic was recorded from West Africa prior to 1920. This date coincides with the return of Senegalese troops from the European war. The epidemic on the Gold Coast in July 1922 was the initial outbreak of recurrent fever in British territory. It was originally discovered among the Zabermawa colony at Accra, and 139 out of 158 infected persons belonged to this tribe. They appear to have brought the disease into Nigeria along the Niger, carrying it down to the delta and thence to Lagos, where 7 cases occurred in July 1923. They are also believed to be responsible for the introduction of plague into Nigeria from the Gold Coast in July 1924. Owing to improved transport facilities. the Sahara can no longer be looked upon as a barrier against diseases from the North, and the importance of guarding against the spread of existing diseases and the introduction of fresh ones, such as typhus, etc., is therefore very great.

ILVENTO (A.). **Notes sur une carte des épidémies dans les pays avoisinant la Méditerranée.**—*Matériaux Etude des Calamités*, ii, no. 6, pp. 119–150. Geneva, July–September 1925. [Recd. December 1925.]

An account is given of the history of, and present situation regarding, epidemic diseases occurring in the Mediterranean countries, including plague, typhus, yellow fever, etc.

[PAVLOVSKĬĬ (E. N.) & SHTEĬN (A. K.).] PAVLOVSKIJ (E. N.) & STEIN (A. K.). **Ueber die Ursachen der Wirkung der Läuse der Gattung *Pediculus* auf die Integumenta des Menschen.** [The Causes of the Action of *Pediculus* on the Skin of Man.]—*Rev. russe Ent.*, xix, no. 1, pp. 17–20, 1 ref. Leningrad, 1925.

The object of these experiments is to explain the mechanism of the pathological reactions produced by lice on the skin of man [*cf. R.A.E.*, B, xii, 81]. A comparison of the saliva of *Pediculus* and *Phthirus* shows that the specific agent only occurs in the kidney-shaped salivary glands [*cf. R.A.E.*, B, xi, 35].

Baylis (H. A.), Pan (T. C.) & Sambon (J. E. B.). **Some Observations and Experiments on *Gongylonema* in Northern Italy. A Preliminary Note.**—*Jl. Trop. Med. & Hyg.*, xxviii, no. 23, pp. 413–419, 14 figs., 5 refs. London, 1st December 1925.

Many insects collected in Northern Italy were examined in an attempt to find the intermediate hosts of *Gongylonema*. Of the many cockroaches and other household pests examined, as well as stored grain pests, none was found to harbour these parasites, and attention was then turned to the dung beetles. Of the individuals examined, between $3\frac{1}{2}$ and 5 per cent. of *Onthophagus taurus*, L., *Caccobius schreberi*, L. (the two most abundant species), *Aphodius haemorrhoidalis*, L., and *Oniticellus fulvus*, Goeze, were found to be infected with *Gongylonema*, and these are the only insects that may certainly be regarded as its intermediate hosts in that region. They occur in the open (all the individuals examined were collected from cow-dung), and it is believed that the larvae of *Gongylonema* found belonged to the cattle form of the Nematode. This is apparently the first time that search has been made for its intermediate host in Europe. *Blattella germanica*, L., was successfully infected by feeding with the eggs of the cattle form of *Gongylonema*, but attempts to infect *Blatta orientalis*, L., failed. Rats fed on *B. orientalis* collected from houses did not become infected, but two rats were experimentally infected with the *Gongylonema* of ruminants (considered by some authorities to be exclusive to ruminants) by feeding them with larvae obtained by dissection from the intermediate hosts.

Thompson (J. G.) & Robertson (A.). **A Note on the Flagellates of Anophelines and Culicines previously mentioned in the Literature with a Description of a Crithidial Form in a new Host, *Anopheles umbrosus*, from the Federated Malay States.**—*Jl. Trop. Med. & Hyg.*, xxviii, no. 23, pp. 419–424, 19 figs., 39 refs. London, 1st December 1925.

A crithidial flagellate is described, taken from the gut contents of two females of *Anopheles umbrosus*, Theo., in the Federated Malay States. The generic and specific identity of these flagellates unfortunately cannot be determined without further observations on the morphology and life-history; though they are comparable with those described by other workers, they have not previously been described from this host. The generic identity of insect flagellates in general is discussed, with special reference to the species noted by various observers in the alimentary tract of mosquitos.

McCallum (F.). **Some Notes on Mice and Bubonic Plague in Australia.**—*Health*, iii, no. 6, pp. 175–177, 6 refs. Melbourne, November 1925.

The question of the relationship of mice (*Mus musculus*) to plague in Australia is discussed, in view of the fact that, at recurrent periods, swarms of mice spread widely across the countryside, following the harvesting of a successful wheat crop, and the possibility that such a movement from a seaport where plague is epizootic might produce an inland enzootic focus of plague. The spread of plague in Australia has hitherto been strictly coastwise; and past experience has shown that mice, under natural conditions, are not very susceptible to the disease,

while there is no definite record of their having carried the infection to man. The only flea known to have been found on mice in Australia is *Leptopsylla segnis*, Schönh. (*Ctenopsylla musculi*, Dug.), which apparently does not attack man. The relationship of mice to bubonic plague and, possibly, to other diseases requires, however, further investigation.

DI MATTEI (E.). **Contributo allo studio della trasmissione delle peste dal ratto all'uomo per via delle Pulci con due casi di peste umana per cattura di topi pestosi.** [Contribution to the Study of the Transmission of Plague from the Rat to Man by Means of Fleas, with two Cases of Plague from the Capture of infected Rats.]—*Atti Accad. Gioen. Sci. nat*, xiv, mem. xii, 16 pp., 50 refs. Catania, 1923–1924. [Recd. December 1925.]

The literature on the subject of the transmission of plague to man by fleas from infected rats and mice is discussed, and numerous cases are quoted.

HUSAIN (M. A.). **Annual Report of the Entomologist to Government, Punjab, Lyallpur, for the Year ending 30th June 1924.**—*Rept. Dept. Agric. Punjab, 1923–24*, Part II, vol. i, pp. 55–90. Lahore, 1925.

The following parasites were collected from rats : *Xenopsylla cheopis*, Roths., *X. astia*, Roths., *X. brasiliensis*, Baker, *Ceratophyllus punjabensis*, J. & R., *Popyplax stephensis*, Christ. & Newst., *P. spinulosus*, Burm., *Androlaelaps* spp. and nymphs of *Haemaphysalis* sp.

LIST (G. M.). **Three new Genera and three new Species of Cimicidae from North America.**—*Proc. Biol. Soc. Wash.*, xxxviii, no. 23, pp. 103–110. Washington, D.C., 13th November 1925.

Hesperocimex coloradensis, gen. et. sp. n., infesting a house in Colorado and the nest of the purple martin in Mexico, *Synxenoderus comosus*, gen. et sp. n., from the nest of the white-throated swift in California, and *Cimexopsis nyctalis*, gen. et sp. n., infesting the fire place of a room in a house in Nebraska, in the chimney of which chimney swifts had been nesting, are described.

MILLER (A. E.). **An Introductory Study of the Acarina, or Mites, of Ohio.**—*Ohio Agric. Expt. Sta.*, Bull. 386, pp. 83–172, 4 pls. Wooster, Ohio, August 1925. [Recd. January 1926.]

In the present paper 127 species of mites and ticks are recorded from Ohio, of which 28 are of economic importance either as crop pests or as attacking man and animals. In the case of the more important of these the most effective methods of control are quoted. As this list is necessarily incomplete, and many genera contain but one species, no keys are given, but the major taxonomic characters are discussed. The technique involved in the preparation and preservation of these Arthropods is described in detail.

Stockman (Sir S.). **Further Observations on Louping-ill.**—*Jl. Comp. Path. & Therapeut.*, xxxviii, pt. 4, pp. 282–291, 3 refs. Edinburgh, December 1925.

It has already been shown that engorged ticks (*Ixodes ricinus*) from sheep infected with louping-ill, after moulting to the next stage, may infect other sheep [*R.A.E.*, B, viii, 56]. In the present experiments young lambs were infected by larvae bred from adult ticks that had fed on infected sheep. The lambs recovered, and their immunity was tested a year later by exposure on infected pasture, where they remained apparently unaffected.

Cousins (H. H.). **Tick Destruction in Jamaica.**—*Proc. 9th W. Indian Agric. Conf., Kingston, Jamaica, 1924*, pp. 153–164, 1 pl. Kingston, Jamaica, 1925.

The introduction of cheap beef cattle from Central America into Jamaica about 30 years ago resulted in the hitherto healthy herds becoming heavily infested with ticks, and Texas fever became widely distributed throughout the Island. A mingling of the naturally resistant zebu cattle from India among the Jamaican herds was then resorted to, with the result that a large degree of resistance to gross tick infestation was established. The quality of beef, however, was considerably reduced, and the cattle were inferior and difficult to handle. In 1909, spraying the cattle was first attempted, and a paraffin-naphthalene emulsion to which arsenic was added was used for the purpose with some success. Owing to the careless use of the spray, however, sufficient ticks escaped to continue the infestation, and dipping was then tried. After nine years' experience, the best dip for use in Jamaica has proved to be 3 lb. paraffin-naphthalene emulsion with 2 lb. sodium arsenite (80 per cent.) per 100 gal. dip. This destroys all ticks without injury to the skin of the cattle, and has been kept in use for over a year without separation of the oil from the emulsion. Dipping has now been made compulsory by law. The effect of this campaign against ticks has been to increase the production of cattle by almost 25 per cent. and to reduce the mortality to negligible proportions.

Stylapanopoulo (M.). **La spirochétose des poules en Grèce.**—*Bull. Soc. Path. exot.*, xviii, no. 9, pp. 701–702. Paris, 1925.

Spirochaetosis of fowls is recorded from Greece, the transmitting agent being *Argas columbae*, Herm. (*reflexus*, auct.).

Langeron (M.). **Présence en Corse de l'***Aëdes* (*Stegomyia*) *argenteus* **(Poiret, 1787).**—*Bull. Soc. Path. exot.*, xviii, no. 9, pp. 723–725, 2 refs. Paris, 1925.

During August, 1925, *Aëdes argenteus*, Poir., was found at Bastia, and probably occurs in other localities in Corsica.

Swellengrebel (N. H.). **Considérations sur la prophylaxie du paludisme par la déviation des Anophèles.**—*Bull. Soc. Path. exot.*, xviii, no. 9, pp. 725–727, 9 refs. Paris, 1925.

The varying opinions of previous writers on the value of animals and increased population as regards the prevalence of malaria in any district

are reviewed ; those of the author are that the proximity of domestic animals to human habitations may reduce the percentage of malaria infections in man, as, owing to the increased food supply, a smaller number of mosquitos would attack any given man. An increased population would have the same effect, its only disadvantages as compared with the use of domestic animals being the facts that many of the newcomers might be particularly susceptible and develop into malaria carriers, and that owing to the greater attraction the animals have for the mosquitos, a smaller number of them would be required to produce the same results. It is further considered that the importance of domestic animals merely as supplying a certain amount of food for the mosquitos, which would in their absence be forced to feed on man, has been somewhat overlooked in attempts to use such animals as a direct measure of control by producing a zoophilic race of mosquitos.

ROUBAUD (E.). **Peuplements humains et peuplements animaux comme facteurs économiques comparés de la déviation anophélienne antipalustre.**—*Bull. Soc. Path. exot.*, xviii, no. 9, pp. 728–730. Paris, 1925.

In commenting on the preceding paper, the author emphasises the importance of animals in the reduction of malaria owing to their apparent attraction for mosquitos, and the fact that the latter obtain food from them without transmitting malaria and without themselves becoming infected.

GIRARD (G.) & LEGENDRE (F.). **Premières observations sur les puces de rat des régions pesteuses de Madagascar.**—*Bull. Soc. Path. exot.*, xviii, no. 9, pp. 730–731. Paris, 1925.

An examination of fleas found on rats in towns in Madagascar in which plague occurs has shown *Xenopsylla cheopis*, Roths., to be the predominant species. At Tananarivo 60 per cent. of the fleas captured belonged to this species, 25 per cent. were *Leptopsylla segnis*, Schönh. (*Ctenopsylla musculi*, Dugès), and 15 per cent. *Echidnophaga gallinacea*, Westw. On six mice examined only *L. segnis* was found.

SÉGUY (E.). **Etude sur quelques Muscides exotiques à larves parasites.** —*Bull. Soc. Path. exot.*, xviii, no. 9, pp. 732–735. Paris, 1925.

The relation of Calliphorine flies in general to myiasis is discussed. *Roubaudiella coerulea*, gen. et sp. n., is described from the French Congo, and a key is given to some allied Calliphorine genera.

BOUET (G.). **Une épidémie de fièvre jaune au Libéria.**—*Bull. Soc. Path. exot.*, xviii, no. 9, pp. 746–754. Paris, 1925.

An account is given of two cases of yellow fever occurring amongst Europeans in Liberia. Though not previously recorded from this part of West Africa, the disease must have been latent among the natives, who apparently exhibit a certain immunity from it. *Aëdes argenteus*, Poir., occurs in the infected locality, where all conditions requisite for its development are present.

Curasson (G.). *Ctenocephalus canis* **parasite du mouton.**—*Bull. Soc. Path. exot.*, xviii, no. 9, pp. 755–756, 1 ref. Paris, 1925.

Although sheep are in general comparatively immune from the attacks of fleas, they are subject to infestation by *Ctenocephalus canis*, Curtis, in certain districts of Algeria.

Infestation is common from November to January. The lower limbs of the animals may be covered with the fleas, and the irritation they produce makes the sheep restless and thus more susceptible to various diseases. In many cases the young lambs succumb as a result of exhaustion.

Ferris (G. F.). **Fourth Report upon Diptera Pupipara from the Philippine Islands.**—*Philipp. Jl. Sci.*, xxviii, no. 3, pp. 329–341, 5 figs., 6 refs. Manila, November 1925.

The Streblid, *Nycteribosca amboinensis*, Rond., from a bat, and the Hippoboscids, *Ornithoica promiscua*, Ferris & Cole [*R.A.E.*, B, x, 175], *Ornithoponus sartus*, sp. n., *Myiophthiria reduvioides*, Rond., and *Ornithoctona magna*, Ferris, from birds, are recorded in the Philippines.

Hesse (E.). **Weitere Mitteilungen über** *Neottiophilum praeustum* **Meig.** [Further Communications on *N. praeustum*.]—*Zeitschr. wiss. Insektenbiol.*, xx, no. 9–10, pp. 270–272, 2 refs. Berlin, 10th December 1925.

Further notes are given on the occurrence of the Acalyptrate fly, *Neottiophilum praeustum*, Mg., in birds' nests [*R.A.E.*, B, xi, 189 ; xii, 60].

Liebermann (A.). **Correlation zwischen den antennalen Geruchsorganen und der Biologie der Musciden.** [Correlation between the Antennal Scent-organs and the Biology of Muscids.]—*Zeitschr. wiss. Biol.*, Abt. A., *Zeitschr. Morphol. u. Oekol. Tiere*, v, no. 1, pp. 1–97, 99 figs., 40 refs. Berlin, 30th November 1925.

This is a detailed account of the antennal scent-organs of Muscids and their function.

Lestage (J. A.). **La Batrachomyase en Belgique.**—*Bull. & Ann. Soc. ent. Belgique*, lxv, no. 9–11, pp. 309–310, 2 refs. Brussels, December 1925.

Myiasis of toads (*Bufo vulgaris*), supposed to be caused by the larvae of *Lucilia bufonivora*, Moniez, is of common occurrence in Belgium, but adults of *L. bufonivora* have not yet been recorded in the country. According to Dr. J. Villeneuve *L. bufonivora* has been derived in geologically recent times from *L. sylvarum*, Mg., from which it is somewhat difficult to distinguish it, although it possesses fixed characters in the male genital armature. Examination of Belgian specimens of supposed *L. sylvarum* will probably reveal the presence of *L. bufonivora*.

Shannon (R. C.). U.S. Bur. Ent. **A Note on the Distribution and Synonymy of a Myiasis-producing Fly.**—*Proc. Ent. Soc. Wash.*, xxvii, no. 9, p. 196. Washington, D.C., December 1925.

Lucilia pallescens, Shann. [*R.A.E.*, B, xii, 75] is apparently identical with *L. argyricephala*, Macq., a myiasis-producing species known from Asia and Africa. Its distribution in the United States is given, and individuals recorded from Hawaii are also considered to be *L. argyricephala*.

Baber (E.). **Fly Control by Means of the Fly-Larval-Trap Manure Enclosure.**—*Jl. R.A.M.C.*, xlv, no. 6, pp. 443–452, 4 figs. London, December 1925.

This is a device for storing manure and fermenting waste matters in such a manner as to trap all larvae of flies [*Musca domestica*] migrating therefrom, and is an elaborated form of a trap previously described [*R.A.E.*, B, vii, 5]. In the present case a trench is built of brick or concrete and surrounds a concrete platform on which the manure, etc., is enclosed by a wire fence. A metal overhang is the essential part of the trench and can be made from sheet galvanised iron cut into strips six inches wide and bent down 1½ inches. It is laid in position between the courses of bricks and projects out over the trench on both sides, being protected by the top course of bricks. A sump of suitable size is essential for the collection of liquids flowing from the manure, this must also be provided with a metal overhang. All the joints of the metal strips must slightly overlap to prevent the escape of the larvae. The larvae should be removed from the trenches and sump two or three times a week and destroyed. The trench must be kept free from any litter, and the liquids in it or the sump should be returned to the manure to assist fermentation. Some users prefer to keep a quantity of liquid in the sump, in which case a 1 in 100 solution of sodium arsenite may be used to act as a poison bait for the adult flies.

The adaptation of this trap for various purposes and its successful application in the past are briefly described.

Otway (A. L.). **A Method of Excreta Disposal in the Tropics which entirely prevents Fly Dissemination.**—*Jl. R.A.M.C.*, xlvi, no. 1, pp. 14–22, 3 figs. London, January 1926.

The disposal of sewage in the Tropics presents very great difficulties where water carriage is impracticable, owing to flies breeding in it and subsequently infesting houses. At Sekondi in the Gold Coast the usual means, such as incineration, dumping at sea or earth disposal in shallow trenches, are, for various reasons, not possible, and the method adopted is disposal in deep pits. The author observed that when the entrances to these were opened large numbers of flies immediately flew out. He found that this was due to their having congregated at the entrance, attracted by the light admitted by the ill-fitting covers, and it is on the fact that the newly emerged fly makes directly for the nearest point of light that the following method depends.

The pits for sewage disposal are 18–20 by 3½–4 by 10–12 ft.; they are covered with timber, brushwood, and beaten earth, tarred or treated with heavy oil. A hole for a trap is placed towards the end, not less than 6–10 feet away from the filling hole. The whole pit

is covered by a thatch and brushwood structure to protect it from torrential rain ; this shelter should be as dark as possible over the filling hole, and as light as possible over the trap, and may have a partition running across it. The fly trap is made from a wooden box, $20\frac{1}{2}$ by $10\frac{1}{2}$ by $14\frac{1}{2}$ inches ; the top is removed and a hole 6 inches in diameter is made in the bottom ; over the hole is fastened a piece of copper gauze rolled into the shape of a cone, open at the top and bottom, 5 inches high, 6 in diameter at the base, and 3 at the top. The top of the box and openings made in the four sides are then covered with copper gauze ; two of the latter should be openable. The completed trap is placed over the hole in the roof of the pit and made completely fly-proof by having earth heaped round its base. The filling hole of the pit has a tight-fitting lid, which should, if necessary, be made light-proof by a covering of sacking. The traps can be changed at night, or during the day by closing the hole in the pit roof with a shutter.

Huge numbers of flies are captured by traps constructed on this principle, and all of them die in the course of a few days. It is estimated that many traps captured 250,000 flies each in 5 or 6 days. Among 2,000 flies examined from one trap, *Lucilia caesar* and *Calliphora vomitoria* predominated in about equal proportions ; *Musca domestica* occurred in much smaller numbers, the two former being about seventy times more numerous ; two specimens of *Sarcophaga* sp. were found ; this last species, however, was found later in larger numbers.

The installation of sewage pits fitted with fly traps and the substitution of pail for pit latrines has brought about a very great reduction in the number of flies in Sekondi, and it is considered that the method would be satisfactory in many tropical countries, and that the principle could be applied to other breeding-places of flies, such as manure heaps.

Bishopp (F. C.), Roark (R. C.), Parman (D. C.) & Laake (E. W.). **Repellents and Larvicides for the Screw Worm and other Flies.**— *Jl. Econ. Ent.*, xviii, no. 6, pp. 776–778. Geneva, N.Y., December 1925.

Experimental work has been carried on for several years by the U.S. Bureaux of Chemistry and Entomology with the object of developing satisfactory larvicides, repellents and attractants for the control of flies affecting live stock. Benzol, introduced a few years ago as a larvicide against the screw-worm fly (*Cochliomyia macellaria*), is much in favour and has no serious drawbacks. Tests with repellents against this fly, other blow-flies and the house-fly (*Musca domestica*) were effected by applying a definite amount of a substance to a weighed quantity of meat placed on sand in an open jar, and recording the reactions of the flies to these as compared with jars containing untreated meat. It was found that a high degree of repellent efficiency against all species of flies under observation was exhibited by some of the war gases, such as chloropicrin, chloroacetophenone, benzyl bromide, benzyl chloride, p-xylyl bromide, beta-chloroethyl acetate, beta-bromoethyl acetate, and chloroacetone. Other substances showing marked repellent value were beta-naphthylethyl ether, nitrobenzene, furfural, salicylic aldehyde, picric acid and a number of substances of the pine tar group. Among essential oils, citronella (Ceylon), cade, fennel and some of the crude camphor oils show the greatest promise. Clove bud oil and clove powder also proved strong

repellents. There is apparently no correlation between chemical groups and repellent qualities; for example, among the chlorides chloroform proved decidedly attractive to *C. macellaria*, while hexachlorethane is distinctly repellent. It may eventually be found that the chemical compounds can be grouped as repellents by their physiological properties rather than by chemical or physical characteristics. The first group of repellents mentioned above are all tear gases having strong lachymatory effects on man, and all are greatly repellent, chloropicrin being so even in a dilution of 1 : 100.

Flies generally found visiting the baits included *C. macellaria*, *Phormia regina*, *Lucilia sericata*, *Muscina stabulans*, *Musca domestica*, *Piophila casei* and *Sarcophaga* spp.; some of these, however, were not present in sufficient numbers to furnish reliable information on their chemotropic reactions. In general, the reactions of various species seem very similar.

In spraying animals against the horn fly [*Lyperosia irritans*], the stable fly (*Muscina stabulans*) and *Musca domestica*, chloropicrin was found to have a distinctly repellent value, but the best diluents have apparently not yet been found. Alcohol, benzol, kerosene and other extracts of pyrethrum all give much promise in the control of *L. irritans*. The destructive action of the carriers on several species of flies is increased by the addition of pyrethrum, even when only one-tenth of a pound of pyrethrum flowers is used per U.S. gallon of spray, though the addition of larger amounts gives more satisfactory results. What is required is to evolve a spray of high toxicity and to combine it with the strongest repellent in non-irritant carriers that will render the mixtures safe when used comparatively freely on animals.

Freeborn (S. B.), Regan (W. M.) & Folger (A. H.). **The Relation of Flies and Fly Sprays to Milk Production.**— *Jl. Econ. Ent.*, xviii, no. 6, pp. 779–790, 1 fig., 4 refs. Geneva, N.Y., December 1925.

An attempt has been made to measure the decrease in milk production occurring under experimental conditions owing to infestation of cows with *Musca domestica* (house-fly), *Lyperosia irritans* (horn fly) and *Stomoxys calcitrans* (stable fly). *L. irritans* is probably the most noticeable fly attacking cattle, and for that reason its importance has undoubtedly been over-estimated. In laboratory trials this species never attacked more than once in a day, the average meal consisting of 3·2 milligrams of blood. The inland valleys of California are not seriously affected by this fly, especially during June, July and August, probably owing to the high temperature and low humidity. Cattle experimentally exposed to heavy infestation by it showed very little (only 1·4 per cent.) depreciation in milk production. The average meal of *S. calcitrans*, on the other hand, consists of 15 milligrams of blood, and on exceedingly hot days these flies will feed twice, once in the early morning and again in the late afternoon. The percentage of loss in milk production attributable to stable flies during one month's infestation was 9·26. *M. domestica* was found to cause a constant depreciation of 3·33 per cent.

It seems to be the practice of dairymen to attempt to combat fly infestation by spraying rather than by proper disposal of manure. Experiments were made with two sprays, one an odourless, non-toxic white petroleum oil, and the other consisting of two parts of that oil with one part of an oil used as a household spray containing an extract

of pyrethrum in distillate. Cattle sprayed with these oils showed an additional loss in milk production of 11·74 per cent. over the 9·26 per cent. due to *S. calcitrans*, and of 11·7 per cent. over the 1·4 per cent. loss from *L. irritans*.

EWING (H. E.). U.S. Bur. Ent. **Sulphur-impregnated Clothing to protect against Chiggers.**—*Jl. Econ. Ent.*, xviii, no. 6, pp. 827–829, 1 pl. Geneva, N.Y., December 1925.

The successful use of sulphur-impregnated clothing [*R.A.E.*, B, x, 116] against chigger mites is described. The formula used was $\frac{1}{4}$ lb. naphtha soap, 1 U.S. gal. water and $\frac{1}{4}$ lb. flowers of sulphur. Both inner and outer garments were soaked in this and then dried, the free sulphur being shaken out before the clothing was worn. This obviates the burning that often occurs when powdered sulphur is dusted on the skin or inside loose garments, where it collects along the seams.

[PARFENT'EV (Ī. A.).] PARFENTJEV (T. A.). **On the Methods of Destruction of Mosquitoes.**—*Jl. Econ. Ent.*, xviii, no. 6, pp. 839–840, 1 fig. Geneva, N.Y., December 1925.

In Russia, measures are taken during the winter to destroy adult mosquitos hibernating in unheated buildings, such as stores, barns and granaries. The Scientific Research Laboratory of the Plant Protection Department has recently conducted successful experiments with smoke obtained by burning waste tobacco powder from factories in the proportion of 30–40 gms. per cu. metre. The powder was mixed with chopped straw or hay and left to smoulder in the room on iron sheets. After 16 hours of fumigation the mosquitos present were generally all dead. In the laboratory, glass tubes containing mosquitos and covered on both ends with muslin were placed under bell-glasses with porcelain saucers containing about 15 gms. of unslaked lime. A nicotine solution diluted with water to a total quantity of 3 cc. of liquid was poured on the lime; the heat produced by slaking of the lime produces steam which carries the nicotine away with it. It was found that by lengthening the duration of exposure to nicotine of *Culex pipiens*, L., and *Anopheles maculipennis*, Mg., from 5 min. to 15 hours, the lethal dose of nicotine can be reduced from 8 to 0·5 gm. per cu. metre.

[MĪTROFANOVA, Yu.] **Митрофанова, Ю. New Data on the Geographical Distribution of** *Anopheles bifurcatus*. [*In Russian.*]—*Russ. hidrobiol. Zeitschr.*, iv, no. 10–12, p. 217. Saratov, October–December 1925.

Larvae of *Anopheles bifurcatus* are recorded near Perm.

GRASSI (B.). **Risultati della lotta antimalarica in seguito alle nuove scoperte.** [The Results of Antimalarial Work following modern Discoveries.]—*Intern. Rev. gesamten Hydrob. u. Hydrogr.*, xiii, no. 3–4, pp. 125–129. Leipzig, October 1925.

This is a review of modern methods of eliminating malaria by means of measures directed against mosquitos. Though they all have disadvantages, they enable extensive reclamation work to be done without danger, and their heavy cost is more than balanced by the results.

Essed (W. F. R.). **Preliminary Report on Malaria on the Poelau Toedjoeh.**—*Meded. Dienst Volksgezondheid Ned.-Indië*, Foreign edn., 1925, pt. 3, pp. 292–300, 1 map. Batavia, 1925.

Poelau Toedjoeh is the name of some groups of islands in the South-China Sea, east and north-east of the Rhio Archipelago [south of Singapore].

The Anopheline larvae found were : *Anopheles maculatus*, Theo., in mountain streams ; *A. aitkeni*, James, in a roadside puddle ; *A. umbrosus*, Theo., abundant in swamps and stagnant pools ; *A. hyrcanus* (*sinensis*) var. *separatus*, Leic., in a very shady well ; and *A. ludlowi*, Theo., in a shallow pool.

Malaria is prevalent in the islands, which may be divided into those with a rather narrow coastal area with hills behind and with mountain brooks characterised by the presence of *A. maculatus*, and those with a rather large coastal area, swamps and dense virgin vegetation infested with *A. umbrosus*.

Essed (W. F. R.). **Malaria at Tandjong-Pinang.**—*Meded. Dienst Volksgezondheid Ned.-Indië*, Foreign edn., 1925, pt. 3, pp. 301–317, 5 pls., 1 map. Batavia, 1925.

Tandjong-Pinang is a town of the Rhio Archipelago [south of Singapore], built partly on hills and partly on a rather narrow strip of coast on the beach and on piles in the sea. Mosquitos bred from larvae taken in the neighbourhood were : *Anopheles maculatus*, Theo., the predominant species ; *A. hyrcanus* var. *separatus*, Leic. ; *A. kochi*, Dön., ; *A. karwari*, James, and *A. umbrosus*, Theo.

A. maculatus, which was rarely found in stagnant water, is considered responsible for the prevalent malaria. It was found to be naturally infected, and it is a well-known carrier in the Malay Peninsula where similar conditions prevail. *A. umbrosus*, *A. hyrcanus* var. *separatus*, *A. karwari* and *A. kochi* occur in too small numbers to be of any importance.

In attempts to control *A. maculatus* the water in springs and brooks must be prevented from flowing on the surface, and as much as possible must be carried off in subsoil drains.

Koidzumi (M.). **Studies on Mosquitos in Formosa.** [*In Japanese.*]—*Rept. Sci. Inst.*, no. 8, 1920, 158 pp., 3 charts, 8 pls. Taihoku, Formosa, 1920. [Received January 1926.]

This paper contains the original descriptions, in Japanese, of *Anopheles pleccau*, *A. taiwanensis*, *A. splendidus* and *A. hatorii*.

Earle (W. C.). **The Relation of Irrigation on Cane Fields to the Malaria Problem.**—*Agric. Notes, Porto Rico Agric. Expt. Sta., Mayaguez, Office Farm Management*, no. 21, multigraph, 3 pp., 1 diagram. San Juan, P.R., November 1925.

The incidence of malaria in Porto Rico is generally much higher on the coastal plains than in the hills, but in both regions the presence of irrigation systems for sugar-cane fields is an important factor in the production of malaria mosquitos. The main supply canals do not usually provide suitable breeding-places for Anophelines, but the smaller supply ditches and those by which water is distributed to the

individual fields often contain stagnant water at a constant level for several months, and thus provide conditions entirely suited to mosquito breeding. It is the proper management of these smaller irrigation ditches, which is in the hands of the cultivators, that is of the greatest importance in malaria control. The placing of dams should be planned carefully, and so far as possible the water level should not be allowed to remain constant for more than a few days. In the rainy season, when many of the irrigation ditches serve for drainage, they should be kept clear so as to allow a proper flow of water. Seepage from irrigation ditches should be guarded against at all seasons, as it often produces swampy places that are suited to mosquito breeding.

HANSON (H.). **General Report on the Yellow Fever Campaign in Colombia, May, 1923, to December 31, 1924.**—*Amer. Jl. Trop. Med.*, v, no. 6, pp. 393–400. Baltimore, Md., November 1925.

In 1923, an epidemic of yellow fever occurred in Colombia, although it had been thought that this part of South America was free from the disease. A commission was appointed to investigate the outbreak, and the organisation of the widespread campaign that was undertaken is described. In many localities, a high general index of *Aëdes argenteus*, Poir. (*aegypti*, L.) was found, without any record of yellow fever. Much evidence was obtained of a wide prevalence of relapsing fever, with abundant occurrence of *Ornithodorus talaje*, Guér. In the course of the campaign, 908,655 houses were visited, in 69,690 of which *A. argenteus* was found breeding, chiefly in containers; and 364,926 larvicidal fish were distributed. *Geophagus steindachneri* did not prove of much value, but *Piabucina panamensis* was effective; *Pimelodella chagresi*, *Dormitator* sp. and other fish were also used. The use of fish in Colombia was not so successful as in Peru, the fish being less hardy species. Partly on account of the reduction of the mosquito index, and partly because most of the susceptible population had become immunised by an attack of fever, the occurrence of new cases gradually ceased. It is believed that no yellow fever now occurs in Colombia, but the mosquito index is generally high, and if the disease should be introduced it would probably spread extensively. Security lies more in the absence of disease in the surrounding countries than in the existing internal conditions. It is considered that the Government should give serious attention to this matter and support efforts to continue the control of *A. argenteus*.

DUNN (L. H.) & HANSON (H.). **Prevalence of the Yellow Fever Mosquito, *Aëdes aegypti* (Linn.), in Colombia.**—*Amer. Jl. Trop. Med.*, v, no. 6, pp. 401–418, 1 map. Baltimore, Md., November 1925.

Statistics are given regarding the incidence of *Aëdes argenteus*, Poir. (*aegypti*, L.) in the various localities inspected in connection with the yellow fever outbreak in Colombia recorded in the preceding paper.

DYAR (H. G.). **Some Mosquitoes from Venezuela (Diptera, Culicidae).** —*Insecutor Inscitiae Menstruus*, xiii, no. 10–12, pp. 213–216. Washington, D.C., 25th November 1925.

The mosquitos recorded include *Culex* (*Melanoconion*) *loturus*, sp. n., *Aëdes traversus*, sp. n., and *Uranotaenia briseis*, sp. n.

Dyar (H. G.). **Note on the Male of** *Aëdes punctifemore* **Ludlow. (Diptera, Culicidae.)**—*Insecutor Inscitiae Menstruus*, xiii, no. 10–12, p. 217. Washington, D.C., 25th November 1925.

The male of *Aëdes punctifemore*, Ludlow, is described from the Philippine Islands.

Dyar (H. G.). *Phoniomyia* **and** *Dendromyia* **again. (Diptera, Culicidae.)**—*Insecutor Insicitiae Menstruus*, xiii, no. 10–12, p. 226. Washington, D.C., 25th November 1925.

As a result of a study of the type species of these genera by R. C. Shannon, and a further consideration of their status [*R. A. E.*, B, xii, 166], *Phoniomyia* is now treated as a synonym of *Wyeomyia*. *Dendromyia luteoventralis*, Theo. (genotype of *Dendromyia* by restriction of Blanchard) falls to *Prosopolepis*. The name *Dendromyia* takes precedence of *Prosopolepis*, and the species recorded under the latter by the author must be transferred to it.

Corson (J. F.). **A Note on Microfilariae in Tanganyika Territory.**—*Ann. Trop. Med. & Parasit.*, xix, no. 4, pp. 381–386, 18 refs. Liverpool, 16th December 1925.

The following is taken from the author's summary :—Little is known of endemic areas of filarial infection in man in Tanganyika Territory. In addition to districts near the great lakes in the north-west, *Filaria* (*A* [*canthocheilonema*]) *perstans* is probably endemic in the south-east. This and *F. bancrofti* are the only forms known to occur.

Evans (A. M.). **A New Variety of** *Anopheles marshalli*, **from Sierra Leone.**—*Ann. Trop. Med. & Parasit.*, xix, no. 4, pp. 461–464, 1 pl. Liverpool, 16th December 1925.

Anopheles marshalli var. *freetownensis*, n., reared from larvae collected near Freetown, is described.

Innes (F. A.). **The Predaceous Habit of the Larvae** *Mucidus scatophagoides.*—*Ann. Trop. Med. & Parasit.*, xix, no. 4, p. 466. Liverpool, 16th December 1925.

Mucidus scatophagoides, Theo., has been bred from larvae taken in shallow grassy pools of rainwater in Gambia. The pupal stage lasts about 2 days. The larvae feed upon those of other mosquitos.

Barber (M. A.) & Hayne (T. B.). **Water Hyacinth and the Breeding of** *Anopheles.*—*Public Health Repts.*, xl, no. 47, pp. 2557–2562, 4 refs. Washington, D.C., 20th November 1925.

There is a conflict of opinion as regards the influence of the water hyacinth (*Piaropis crassipes*) on the presence or absence of mosquito larvae [*cf. R.A.E.*, B, xii, 55, 194]. Surveys have been made in Louisiana, Mississippi and Florida, in places and seasons both favourable and unfavourable to mosquito production, including midwinter. Anopheline larvae were found in water containing these plants throughout the year except in December. The incidence of the different species varies with season and locality, though *Anopheles*

crucians, Wied., was found in every collection made. In midwinter *A. quadrimaculatus*, Say, was only found where water hyacinth occurred, in southern Louisiana. Other species collected were *A. punctipennis*, Say, and *A. walkeri*, Theo. Top minnows were present in all localities in which larvae were collected from water hyacinth. No biological factor peculiar to water hyacinth and unfavourable to Anophelines was found to be of general occurrence, and the latter sometimes occur in large numbers in waters covered with it, the weed interfering with wave action and the activities of minnows, and hindering the use of larvicides, etc. Extensive production of Anophelines is not, however, universal in its presence, and its eradication is often difficult, so that, for public health purposes, it is only recommended where there is evidence that Anophelines are abundant and there is a significant amount of malaria in the vicinity. The further spread of the plant to new waters should be discouraged.

VAN HOOF (L.). **Le paludisme dans la région de Léopoldville. Epidémiologie, prophylaxie.**—*Ann. Soc. belge Méd. trop.*, v, no. 1, pp. 79–91, 7 refs. Brussels, June 1925. [Recd. January 1926.]

Numerous tables are given showing the results of a survey of the villages around Leopoldville in order to ascertain the prevalence of malaria. *Plasmodium vivax* appears to be entirely absent, whilst *P. praecox* was more frequently encountered than *P. malariae*.

Of the mosquitos taken 34 per cent. were *Culex fatigans*, Wied., and 21 per cent. *Anopheles costalis*, Theo., less numerous species including *A. funestus*, Giles, *A. marshalli*, Theo., *Taeniorhynchus cristatus*, Theo., *T.* (*Mansonioides*) *uniformis*, Theo., *T.* (*M.*) *africanus*, Theo., *C. duttoni*, Theo., and *Aëdes argenteus*, Poir.

DAVIS (N. C.). **A Field Study of Mountain Malaria in Brazil.**—*Amer. Jl. Hyg.*, vi, no. 1, pp. 119–138, 2 charts, 9 refs. Baltimore, Md., January 1926.

This is an account of a short survey of the malaria conditions in some construction camps in the mountains of the State of Rio de Janeiro, Brazil. The region is heavily forested, and numbers of Bromeliaceous plants occur, of which *Nidularia rutilans* was the most favoured by mosquitos. Nearly a fifth of the population of the camps was found to be infected with malaria.

The predominant Anopheline is *Anopheles cruzi*, D. & K. (*Myzomyia lutzi*, Theo.), which is now considered distinct from *A. bellator*, D. & K. [*R.A.E.*, B, xiii, 91]. Other Anophelines found were *A. eiseni*, Coq., *A.* (*Myzorhynchella*) *lutzi*, Cruz, and *A.* (*Cellia*) *argyritarsis*, R. D. Individuals of *A. eiseni* refused to feed on blood for 48 hours after emergence, but readily did so at 54 hours. *A. lutzi* could not be induced to feed on human blood.

Though probably a large number of the infections are acquired by workers visiting the lowlands or occur in new arrivals from malarious districts, *A. argyritarsis* is probably responsible for most of the new infections, as both *A. cruzi* and *A. eiseni* were found very difficult to infect experimentally. *A. argyritarsis* is considered the principal vector of malaria in the low littoral of the State of Rio de Janeiro.

Senior-White (R.). **Physical Factors in Mosquito Ecology.**—*Bull. Ent. Res.*, xvi, pt. 3, pp. 187–248, 8 diagr., 56 refs. London, January 1926.

The conclusions reached in this paper, for the details of which the original should be consulted, are based on a total of 700 observations begun by the author early in 1923, whilst working on the mosquito fauna of Ceylon. Though at first it appeared that the toleration of pH values by the larvae of the different species could be easily ascertained, and would prove to be the factor limiting their occurrence, in many cases the larvae disappeared from waters that were apparently suitable, and returned to it without any alteration in the pH value, so that the work on the hydrogen ion concentration had to be supplemented by investigations of other factors, such as the relative proportions of total solids in solution, and the oxygen and ammonia contents of the water. Throughout the investigations the pH was measured colorimetrically, by means of Clark & Lubs' indicators. Even in extreme cases of discoloured water accuracy to pH 0·2 was usually possible by adding single drops of indicator to very small quantities of water on a white tile. The total solids in solution were measured proportionately by electrical conductivity (at a temperature of 25° C. [77° F.]), using a Kohlrausch bridge reading direct in ohms, and a Hamburger cell, calibrated by testing with N/100 KCl, and are summarised in terms of conductivity $\times 10^6$. The oxygen in solution was measured by Winkler's method and the saline ammonia by direct Nesslerisation, using the U.S. Public Health Association (1920) method for precipitating the magnesium and calcium hydroxides before adding the reagent. The albuminoid ammonia, though more important, could not be measured owing to lack of the necessary apparatus.

The majority of the mosquitos dealt with are divided into the following groups :—

Moving-water group : *Anopheles leucosphyrus*, Dön., *A. aitkeni*, James, *A. karwari*, James, *A. maculatus*, Theo., *A. listoni*, List., *Uranotaenia campestris*, Leic., *Culex castrensis*, Edw., *C. minutissimus*, Theo., and *C. bitaeniorhynchus*, Giles. Standing-water group : *A. fuliginosus*, Giles, *A. jamesi*, List., *A. barbirostris*, Wulp, *A. sinensis*, Wied., *A. vagus*, Dön., *C. mimulus*, Edw., *C. tritaeniorhynchus*, Giles, *C. whitmorei*, Giles, *C. vishnui*, Theo., *C. fuscocephalus*, Theo., *C. fragilis*, Ludl., *C. bahri*, Edw., and *Aëdes pseudomediofasciatus*, Theo. Rock-pool group : *A.* (*Finlaya*) *pseudotaeniatus*, Giles, *A.* (*F.*) *macdougalli*, Edw., and *A.* (*Stegomyia*) *vittatus*, Big. (*sugens*, Theo.). Coconut-shell group : *A.* (*S.*) *albopictus*, Skuse, and *A.* (*F.*) *chrysolineatus*, Theo. (*trilineatus*, Theo.). Tree-hole group : *Orthopodomyia anopheloides*, Giles, *A.* (*F.*) *gubernatoris*, Giles, *A.* (*F.*) *greeni*, Theo., and *C. brevipalpis*, Giles. Bamboo group : *Rachionotomyia aranoides*, Theo., *C. uniformis*, Theo., and *C. minor*, Theo. Foul-water group : *Armigeres aureolineatus*, Leic., *A. obturbans*, Wlk., *C. fatigans*, Wied., and *C. pallidothorax*, Theo. Predators : *Megarhinus splendens*, Wied., and *Lutzia fuscana*, Wied.

As a result of his observations, the author concludes that natural waters in Ceylon extend in pH range from 5·4 to 9·2, but mosquito larvae in general are only found between pH 5·8 and 8·6. Species living in moving water have wider tolerances than those of standing water, and the former extend further into acidity, and the latter into

(K2885) Wt P 7/D 23 1,500 3/26 H & Sp Gp 52

alkalinity, respectively. Anophelines have wider tolerances than Culicines. The measurement of "residual" pH, *i.e.*, the value after bringing the water into gas-equilibrium with the air, is shown to be of value. Natural-water breeders are thus found to be intolerant of any acidity not caused by CO_2.

The natural-water breeders are all found in water with $C \times 10^6$ of $<1{,}000$. The artificial-water breeders extend their range into much higher concentration. There is the possibility of the existence of biological races of natural-water breeders in brackish water, but in inland waters the moving-water species have their optimum at <300, and the standing-water species at <500. The former, again, have wider tolerance limits.

There appears to be no sharply limiting factor in dissolved oxygen, but waters in which this is low are not favoured by Anophelines. In rice-fields the presence of *A. listoni*, the only malaria carrier commonly breeding in them, is shown to be dependent on a considerable amount of dissolved oxygen, and methods for avoiding this are discussed.

Saline ammonia in amounts of even less than 1 part per million is inhibitory to natural-water breeders, especially Anophelines. The "association unit" hypothesis of Hacker [*R.A.E.*, B, ix, 73] is shown to be well founded. There is a feeding-association of certain mosquitos, mainly Anophelines, with certain algae, on the presence of which that of the mosquitos probably depends.

The pH of the various parts of the larval gut is tabulated. There is shown to be very little difference between various species. In all of them the mid-gut is very alkaline, the other parts less so. Diseased conditions seem to be related with decreased alkalinity.

KUDO (R.). **Observations on** *Endamoeba blattae.*—*Amer. Jl. Hyg.*, vi, no. 1, pp. 139–152, 4 pls., 2 figs., 19 refs. Baltimore, Md., January 1926.

This paper presents a brief summary of the author's observations on the trophic stage of *Endamoeba blattae* occurring in the colon of *Blatta orientalis*, L.

KIEFFER (J. J.). **Faune de France. 11. Diptères (Nématocères piqueurs): Chironomidae Ceratopogoninae.**—8vo, iii+139 pp., 83 figs., 4 pp. refs. Paris, P. Lechevalier, 1925. Price *Frs.* 18.

A general account is given of the adults and larvae of the Ceratopogonines of France and neighbouring countries, including keys to the genera and species. New species and varieties are *Dasyhelea versicolor* var. *insignipalpis*, n., from Central Europe; *D. verticillata*, sp. n., from France and Hungary; *Culicoides subfasciipennis* var. *analis*, n., from Belgium; and *Bezzia hydrophila* var. *stagnalis*, n., from Thuringia and the Rhine district. *Neurohelea*, gen. n., is erected for *Clinohelea luteitarsis*, Meig., and *Bezzia media*, n.n., for *B. solstitialis*, Goetg. nec Winn.

BRAU (—). **La lutte contre la maladie du sommeil au Cameroun.**—*Ann. Méd. & Pharm. colon.*, xxiii, no. 3, pp. 403–444. Paris, September–December 1925.

During the German administration of Kamerun, an energetic and comprehensive plan of campaign was undertaken against sleeping

sickness. This included the quarantine of infected territory ; search for infected persons and sterilisation of carriers ; and direct methods against tsetse-flies [*Glossina*] by intensive clearings. Small trees and undergrowth were cut down, and the areas burnt over two or three times during the long dry season and once during the short one, thus destroying the roots and preventing fresh growth from appearing. The grasses on this burnt area are inadequate to harbour *Glossina*, and the pupae are generally killed by the heat of the fires. Collection of flies was also undertaken by natives under supervision, fly-traps, sticky substances, etc., being used for this purpose. Since the French occupation, this project has been continued, several of the chief routes being cleared, as well as the vicinity of wells and fords wherever possible, and every attempt has been made to bring the land under cultivation, sweet potatoes in particular being used for this purpose. Under a decree of 23rd January 1923, the villages have been removed a few hundred yards from streams or rivers, and all landing-stages and water-holes are cleared. Statistics are given showing a very large reduction in the number of deaths from sleeping sickness in one of the most heavily infected districts of Kamerun, in fact, of the whole of tropical Africa, in consequence of these measures.

NOGUE (—). **L'épidémie de fièvre récurrente en Afrique occidentale française (1921–1924).**—*Ann. Méd. & Pharm. colon.*, xxiii, no. 3, pp. 445–466. Paris, September–December 1925.

The recent epidemic of recurrent fever in French West Africa having now died down, the work done in connection with the outbreak is reviewed. All observers were agreed in considering lice [*Pediculus*] to be the transmitting agents. It is noticeable that tribes that wore no clothing were practically immune, the only cases of the disease being found among individuals who harboured lice in their girdles of cowries. *Ornithodorus moubata* was not observed, and seems not to occur in the districts ravaged by the epidemic.

MENSE (C.). **Handbuch der Tropenkrankheiten.** [Handbook of Tropical Diseases.]—3rd Edn., Vol. IV, xii+762 pp., 149 figs., 29 pls. Leipzig, J. A. Barth, 1926. Price, Paper 66 *Gold Marks*, Bound 70 *Gold Marks*.

Among the diseases dealt with in this volume of Mense's Handbook—of which vol. i has already been noticed [*R.A.E.*, B, xii, 58]—there are many of which Arthropods are or may be carriers. These include typhoid, typhus fever, Rocky Mountain spotted fever, malaria, sleeping sickness, American trypanosomiasis, yellow fever, verruga peruviana or Oroya fever, dengue, sand-fly fever, and kala-azar. The method of transmission is discussed in each instance, and copious bibliographies are given for most of the diseases.

[NIKOL'SKIĬ (V. V.).] NIKOLSKY (V. V.). **Observations on the Ability of Larvae of *Anopheles maculipennis*, Mg., to crawl.**—*Bull. Ent. Res.*, xv, pt. 2, pp. 177–178. London, November 1924.

It is known that larvae of *Anopheles maculipennis*, Meig., in all stages, are able to crawl and can sometimes wander from one pool to another. While it cannot be stated that they always crawl in the

direction of water, the direction of movement seems to be determined by differences in the dampness of the surface over which they travel and by the positive hydrotaxis of the larvae. They can crawl on any surface that does not absorb moisture too quickly, and if they encounter a surface absorbing water they suddenly alter their direction. In the case of water collected in hoof-prints, they have been seen to crawl from one to another as each dried up. The maximum distance covered by a larva observed under natural conditions was 75 cm. (29·5 inches).

The author has observed that emergence may occur from pupae that are not in water, but merely on moist soil. Larvae also can withstand a certain amount of drying and, under conditions in the Moscow Government, may live on moist soil for as long as 3 days. During crawling, they are subject to attacks by carnivorous flies, such as *Lispa uliginosa*, Fall.

Ingram (A.) & Macfie (J. W. S.). **A Further Note on African Ceratopogoninae. ii.**—*Bull. Ent. Res.*, xv, pt. 2, pp. 179–184, 3 figs. London, November 1924.

Completing their account of the examination of a collection of Ceratopogonine midges [*R.A.E.*, B, xi, 154] the authors describe the male of *Atrichopogon hirsutipennis*, I. & M., from Nyasaland (hitherto described from a single female), *A. stannusi*, sp. n., from the Gold Coast and Nyasaland, and *Ankistrodactylus corsoni*, sp. n., from the Gold Coast, and give some remarks on the variability of *Culicoides inornatipennis*, C., I. & M., and new records of the distribution in the Gold Coast of this species and of *C. grahami*, Aust., and *C. fulvithorax*, Aust.

Lloyd (Ll.). **Note on the Occurrence of a Herpetomonad in** *Glossina morsitans*.—*Bull. Ent. Res.*, xv, pt. 2, pp. 185–186, 1 fig., 1 ref. London, November 1924.

Since the publication of a recent paper that attempted to describe and illustrate all the known types of flagellate infections encountered in *Glossina* [*R.A.E.*, B, xii, 85], a flagellate that apparently has not been previously described has been observed in 3 individuals of *G. morsitans* in Northern Nigeria. It proved to be a Herpetomonad, which is here described and figured. It is evidently very rare in the locality and probably of no economic importance.

Carpenter (G. D. H.). **Report on an Investigation into the Epidemiology of Sleeping Sickness in Central Kavirondo, Kenya Colony.**—*Bull. Ent. Res.*, xv, pt. 2, pp. 187–208, 1 pl., 2 maps. London, November 1924.

During 1924 an investigation was made into conditions with regard to sleeping sickness on the east coast of the Victoria Nyanza in Central Kavirondo. During the epidemic that raged round the lake at the end of last century and the early part of the present one, the people of Kavirondo were not forcibly removed from the lake shore as was done in Uganda. A natural re-distribution of the population therefore occurred, certain parts being avoided as too dangerous for habitation, and other parts being inhabited, and occasionally suffering from outbreaks of the disease. Along the 100 miles of coast examined,

Glossina palpalis occurs plentifully, and ample evidence was obtained that non-mammalian blood is much preferred to that of the hippopotamus, which was the only source of mammalian blood, except man and cattle in some localities. No trypanosomes of mammalian type were found in 238 individuals of *G. palpalis* examined. *G. brevipalpis* occurs in the neighbourhood of Kadimu Bay, frequenting the places where hippopotamus sleep in the dense bush, and much preferring their blood to that of birds and reptiles. While the population has largely retired from the lake shore, a good deal of fishing is done along the coast. The desire to return to the water needs watching, lest the breadth of contact between fly and people be raised to danger-point. *G. palpalis* is probably more numerous than formerly in places where dense bush has grown up since the localities were left uninhabited. In view of the absence of this species behind broad belts of papyrus, the population should be encouraged to return to those parts in preference to others. Elsewhere, it is considered that safety could be secured by clearing all landing and watering places for 200 yards along the coast on each side of the actual landing and for 50 yards back from the water. To ensure that infected fishermen should not carry the disease from place to place, a system of licences certifying that the applicant is free from sleeping sickness might be adopted. So far as could be ascertained, the disease is quiescent at the present time, the only deaths reported being among people finally evacuated from Mageta Island during recent epidemics there. The presence of these infected people in a settlement on the mainland, close to natives who have never acquired the disease, is strong evidence that agents other than *Glossina* are not of material importance in the epidemiology of the disease. The examination of infested localities seemed to show that broad contact between a population of a density of over 40 per square mile and *G. palpalis* at the rate of more than 15 males per boy per hour conduces to infection by *T. gambiense*.

Carpenter (G. D. H.). **Report by the Senior Medical Officer i/c Sleeping Sickness for 1924.**—*Uganda Prot.: Ann. Med. & Sanit. Rept. 1924*, pp. 70–76. Entebbe, 1925. [Recd. December 1925.]

Sleeping sickness is considered, generally speaking, to be under control in Uganda, but much still requires to be done in the Northern Province, where a medical officer for sleeping sickness duty alone is required. Inspection should be thorough, so that fishing regulations could not be evaded. The increased movement of labour, particularly as employed by private individuals, which it is impossible to control, is liable to result in spreading the disease, and it seems inevitable that before long an infected native from the Northern Province will come into contact with *Glossina palpalis* on Lake Victoria. It is, therefore, of the utmost importance, especially in the uninfected lake area, that adequate clearings should be maintained for the protection of the general population, and that extreme care should be taken on Lake Victoria that no fisherman escape the biennial medical examination, so that no infected person should come into contact with the fly at places where there are no clearings. *G. morsitans* has not apparently yet been infected with human trypanosomes in Uganda. The presence of the disease, although quiescent, in Kavirondo [see preceding paper] is a constant danger, and control of fishermen similar to that in Uganda should be undertaken in Kenya Colony. The

situation in various localities is reported upon. As it is impossible to restrain the movement of natives, preventive clearing is of supreme importance.

GOWDEY (C. C.). **Report of Government Entomologist.**—*Jamaica: Ann. Rept. Dept. Sci. & Agric., 1924*, pp. 17–20. Kingston, 1925. [Recd. January 1926.]

With the intention of testing their effect on mosquito breeding, two indigenous species of *Chara* were collected; after two days, the water in the receptacles used was found to be teeming with larvae of *Aëdes argenteus*, Poir.

BUXTON (P. A.). **The Control of Mosquitoes in Apia, Samoa.**—*Mandated Terr. W. Samoa: Ann. Rept. Dept. Health, 1924–25.* pp. 22–23, 2 pls. [*sine loco*, n.d.] [Recd. January 1926.]

Aëdes variegatus, Dol., is a carrier of filariasis in Samoa, its chief breeding-places being opened coconut shells and rot-holes in trees. An attempt has been made to control this mosquito in part of Apia, but though its numbers have been greatly reduced, it cannot at present be exterminated owing to the presence of large forest areas with their innumerable rot-holes. Special attention should be paid to clearing of scrub in paddocks, etc., around gardens, so that coconut shells can be found and destroyed. This and attention to rot-holes will maintain the reduction of numbers of *A. variegatus*. A search is to be made in the New Hebrides for insects that might be introduced into the rot-holes to prey on this mosquito.

Culex fatigans, Wied., breeds mainly in septic tanks and pit privies, where it may be easily exterminated by screening the ventilators in the former with gauze, and by treating the latter with cresol once a month. *A.* (*Finlaya*) *kochi*, Dön., may be exterminated by forbidding the cultivation of yams (*Colocasia* spp.), as its only regular breeding-place is in the water at the bases of their leaves. The importance of draining the swamp areas is pointed out; above all else, they are a great potential danger in the event of the introduction of Anophelines from the New Hebrides.

RUDOLFS (W.). **Studies of Mosquito Repellents.**—*Rept. New Jersey Agric. Expt. Sta., 1923–24*, pp. 350–353. New Brunswick, N.J., 1925. [Recd. January 1926.]

A large number of essential oils, heavy oils, chemicals and mixtures were tested as mosquito repellents under three conditions; namely, with cold and warm materials on confined mosquitos and cold materials placed on the skin in the open. The experiments were made with *Aëdes sollicitans*, *A. cantator* and *Culex pipiens*, and were all repeated several times. The results are given in a table in which the reaction of the confined mosquitos to the cold materials and the time taken to alight on and bite hands treated with the materials are recorded. It would appear that directly repellent substances are of more value than those that mask the body odour. The substances tested differed greatly in their value as measured by the time during which they afforded protection. Not all those that have the greatest effect on the physical condition of the mosquitos are the best protecting materials. Few only of the substances tested afforded protection for more than an hour,

and none gave absolute protection. Some of the best were pyrethrum (mixed with vaseline) and clove oil, both of which gave protection for 100 to 120 minutes ; oils of lime, pennyroyal, and rose geranium, effective for 90 minutes ; and oils of bitter almond, hemlock spruce, *Pinus pumilio*, and thyme, effective for 75 minutes. The time of protection is materially influenced by the volatility of the substances. The most promising were mixed with talcum powder, corn starch, vaseline, etc., and in all cases the time during which they remained effective was considerably extended.

WALDEN (W. M.). **Report on Mosquito Work. Practical Work.**— *Rept. New Jersey Agric. Expt. Sta., 1923–24*, pp. 353–371, 6 figs. New Brunswick, N.J., 1925. [Recd. January 1926.]

The salt marsh drainage work carried out in the maritime counties of New Jersey is described. A mosquito survey of a large cedar swamp showed that apparently very little mosquito breeding takes place there ; the only mosquito present was *Aëdes sollicitans*, which had come from the neighbouring salt marshes. During the latter half of 1923 and the first half of 1924 mosquitos were not generally prevalent in New Jersey. *A. sollicitans* was, however, common in several places, and the fresh-water species, *A. vexans* (*sylvestris*) and *A. canadensis*, also occurred locally in some abundance.

WILLIAMSON (K. B.). **Annual Report of the Malaria Bureau, Institute for Medical Research, Federated Malay States, for the year 1924.**— *F.M.S.: Ann. Rept. Med. Dept., 1924*, pp. 25–28, 1 ref. Kuala Lumpur, 1925.

A mosquito survey of Pulau Jerejak, during fairly dry weather, but when seepage was fairly abundant, showed that 94 per cent. of the Anopheline larvae present were *Anopheles maculatus*, Theo., the remaining 6 per cent. consisting of *A. barbirostris*, Wulp, *A. hyrcanus*, Pall. (*sinensis*, Wied.), *A. fuliginosus*, Giles, and *A. leucosphyrus*, Dön. Preliminary experiments by S. Ampalavanar with Paris green as a mosquito larvicide have shown that it is toxic to larvae of both Anophelines and Culicines [but *cf. R.A.E.*, B, xiv, 17], but that it does not affect the pupae of either, whether applied as a surface film or as a heavy suspension. The filtrate from a suspension of Paris green is toxic to larvae, and evidently contains a soluble poison.

In view of MacGregor's hypothesis that the degree of alkalinity or acidity of water in mosquito breeding-places is the main factor in determining the species present [*cf. R.A.E.*, B, x, 25 ; xii, 79] a survey has been begun to record these factors. The Anophelines breeding in cleared jungle, such as *A. maculatus*, *A. karwari*, James, and *A. tessellatus*, Theo., appear to have a preference for acid water, with pH values ranging from below 5·5 to about 6·6, the latter figure being approximately that for the streams, while the seepage water is much more acid. The larvae of species that breed in marshes, rice-fields, and ponds, such as *A. barbirostris*, *A. kochi*, Dön., *A. hyrcanus*, and *A. fuliginosus*, have been found in water with a pH range from about 6·4 to just over 8, but most commonly in slightly acid water, with a pH value just below the neutral point, 7. The water in most of the rice-fields in Perak and of some tested in Selangor was acid, but a few fields in Negri Sembilan contained alkaline water, pH about 7·8. In one of these latter fields larvae of *A. aconitus*, Dön., were found ;

this species, which is widely distributed in marsh land containing acid water, is considered by Sir M. Watson to be the main factor in determining the presence or absence of malaria in rice-fields in valleys in Malaya. The pH value of water in which *A. ludlowi*, Theo., formerly bred at Port Swettenham, and of pools and conduits in the vicinity of mangrove swamps generally, is usually slightly above 8. Larvae of *A. umbrosus*, Theo., have been found in extremely acid water, pH below 5, usually peaty and devoid of algae. It appears that there are many factors other than the degree of alkalinity or acidity of water that determine the presence of larvae of particular species. Water in rice-fields may be quite as acid as in the hill streams, but does not harbour species such as *A. maculatus*, which occur in the latter. It is, however, considered that there are limits in acidity or alkalinity that are not usually passed by particular species in nature.

Work has been begun in collecting algae and other water plants, water insects, and fish, with a view to correlating their presence with the presence or absence of Anopheline larvae in general, or of any particular species, and with the reaction of the water in which they occur. It is hoped to discover plants that will serve as indicators of the probable presence of particular larvae ; also what relation particular species of algae bear to larval food supplies. It is thought that the feeding habits of larvae and the varying power of different species to assimilate the micro-organisms present in different kinds of water probably constitute the prime factors regulating their distribution in nature. The complicated relationships that exist are illustrated by observations on two types of Nepid water-bugs. One type, represented by *Cercotmetus* sp., which possesses a short, broad tail siphon, and usually floats just below the surface of the water, seems to be specialised in structure and habits for feeding on larvae of mosquitos, especially Anophelines ; individuals have been kept for several weeks on this diet, and killed about twenty larvae daily. The other type, represented by *Ranatra* sp., possesses a long, thin tail siphon, and usually creeps about on submerged water plants. Although it will catch Anopheline larvae if placed in very shallow water, and may do so occasionally in nature, its principal food consists of free-swimming organisms, including larvae of mayflies [Ephemeroptera], which are reputed to be among the most destructive enemies of mosquito larvae. The activities of both types of water-bug, but especially of *Ranatra*, are liable to supplement those of the fish, which do not usually penetrate into the weeds where the insects are found.

JAMES (S. P.). **Note on the Principles to be followed in Measures for Controlling Mosquitoes in England.**—*Ministry of Health*, Med. I. Memo., N.S., 78, 7 pp., multigraph, 4 refs. [London, 1925 ?]

The bulk of the information contained in this memorandum has already been noticed from another source [*R.A.E.*, B, xiii, 186]. The control measures are given and the life-histories briefly outlined under the two main groups of " domestic " mosquitos, found chiefly in houses and outbuildings, where the females pass the winter, and " rural " mosquitos, which cause annoyance in the open, and which pass the winter in the egg or larval stage ; the latter group is subdivided into single-brooded, double-brooded, and multiple-brooded species.

CARTER (H. F.). **Report on "Kataragama" Fever: its Nature, Causes, and Control. (July 20 to August 4, 1925.)**—*Ceylon Sessional Papers*, no. 37, 1925, fol. 9 pp., 2 pls. Colombo, 1925. Price 25 *cts.*

For a number of years pilgrims returning from a festival held annually at the village of Kataragama, in southern Ceylon, usually at the end of July and beginning of August, have been especially subject to outbreaks of fever of an undetermined nature. It was thought possible that the disease might be sand-fly fever, but no *Phlebotomus* was found. Malaria, however, was found to be endemic, and the investigation leaves little doubt that it is the disease in question.

At the time of the investigation the only places suitable for mosquito breeding were a disused well, a large tank, and the river. Larvae of *Culex* (*Lophoceratomyia*) *minutissimus*, Theo., were found in the well, but none in the tank. When the river was high, larvae of *Anopheles listoni*, List., and *A. barbirostris*, Wulp, were found along the banks and among débris. Larvae of *A. culicifacies*, Giles, and *A. subpictus*, Grassi, appeared in large numbers in the pools on the sand-banks after the river had dropped. *A. listoni* and *A. culicifacies*, which doubtless breeds in many temporary pools about the village in the wet season, are probably the chief carriers of malaria in the low-country of Ceylon. In careful searches for adult mosquitos small numbers of *A. culicifacies* and *A. subpictus* were found in the early morning in tents and whitewashed buildings; very few specimens of *A. barbirostris*, and none of *A. listoni* were found. It is presumed that the absence of adults of the last-named species is accounted for by a longer period spent in the immature stages than is the case with *A. culicifacies* and *A. subpictus*, large numbers of which were almost ready to emerge when they were swept away by a rise of the river. But for the rapid rise of the river, mosquitos would probably have been abundant in a few days, and it is possible that *A. culicifacies* was more abundant than appeared, owing to the great difficulty of detecting it in the native houses. Thirty specimens of *A. culicifacies*, 4 of *A. subpictus*, and 1 of *A. barbirostris* were examined for malarial parasites with negative results. One case of malaria evidently contracted during the festival is recorded. Provided that the river is low in the weeks immediately preceding the festival, thus ensuring an abundant supply of Anophelines, the conditions are extremely favourable to the production of malaria in epidemic form.

Measures to protect the pilgrims during the festival could, therefore, be restricted to a relatively short period of the dry season and would include the maintenance of a high water level in the river and the removal of débris.

HASLAM (J. F. C.). **Report on Experimental Use of Fish indigenous to British Guiana for the Control of Mosquitoes breeding in Vats, Tanks, Barrels, and other Water Containers.**—*Br. Guiana*, C.S.O. no. 3579/25, fol. 8 pp. Georgetown, May 1925. [Recd. January 1926.]

Of a number of kinds of fish experimented with under natural and laboratory conditions, the most satisfactory for use in mosquito control in British Guiana include *Hoplosternum littorale*, *Cichlasoma bimaculatum* and silverbait (*Tetragonopterus chalceus*, *Charax gibbosus*, *Hemigrammus rodwayi* and *H. unilineatus*). The silverbait are the

most suitable for small domestic water-containers ; they are voracious feeders, devouring all stages, and they are easily obtained. Their use by villagers is proving most satisfactory, particularly as it does away with the continual rescreening of vessels. The other two species do well in large vats and tanks.

Bosch (W. G.). **Wederom** *Cellia kochii* **de Overbrenger van Malaria.** [*Anopheles kochi* once again a Carrier of Malaria.]—*Geneesk. Tijdschr. Ned.-Indië*, lxv, no. 6, pp. 760–765. Batavia, 1925.

An increase of malaria in 1925 on a rubber plantation on the east coast of Sumatra, where the author is a medical officer, was due to *Anopheles* (*Cellia*) *kochi*, Dön. It was by far the commonest species ; 3·7 per cent. of the individuals captured were infected ; 86·6 per cent. of these fed on cases of malignant tertian malaria became infected ; and no infected individual of another species was ever captured.

Kemner (N. A.). *Oeciacus hirundinis* **Jen. Svalans väggius i Sverige.** [*Cimex hirundinis*, the Swallow Bug, in Sweden.]—*Ent. Tidskr.*, xlvi, no. 4, pp. 225–227, 2 figs. Stockholm, 1925. [Recd. January 1926.]

Brief morphological and biological notes are given on *Cimex* (*Oeciacus*) *hirundinis*, Jen., infesting swallows.

Sanderson (C. J.). **The Progress of Tick Control on the North Coast.**—*Agric. Gaz. N.S.W.*, xxxvi, pt. 12, pp. 895–898. Sydney, 1st December 1925.

This is an extract from the annual report of the Board of Tick Control, New South Wales, for the year ended 30th June 1925. The progress in the eradication of the cattle tick [*Boophilus annulatus australis*, Fuller] during the year in the area quarantined on account of infestation has been very promising, and has been greatly assisted by the attitude of the farmers [*cf. R.A.E.*, B, xi, 68]. In spite of the meteorological conditions being favourable to tick development, the infestation has been reduced over 60 per cent. in some cases. The system of dipping only those cattle that were found on inspection to be tick-infested has been replaced in some areas by universal dipping of stock, and the superior value of this method has been amply proved ; this is due partly to the difficulty of finding young ticks when inspecting lightly infested cattle, which thus appear uninfested. Considerable attention has been paid to the maintenance of the boundary fences of the quarantine areas, as these are considered of great importance in preventing the spread of infestation.

Mohler (J. R.). **Report [1924-25] of the Chief of the Bureau of Animal Industry.**—*U.S. Dept. Agric.*, 40 pp. Washington, D.C., 1925. [Recd. January 1926.]

The work of suppressing Texas fever in cattle and eradicating ticks in the Southern States since 1906 has resulted in 704 out of 975 counties being released from quarantine.

The use of wading tanks for the control of ox warbles [*Hypoderma*] [*R.A.E.*, B, xii, 67] has been continued. The materials used were

coal-tar creosote dips, pine-tar emulsions, crude petroleum, or a mixture of oils ; they were floated on the water in the wading tanks. Though the treatment failed to eradicate warbles, the cattle subjected to it were freer from infestation the following season than untreated animals. Processed crude petroleum and coal-tar creosote (freshly diluted) proved the most effective.

PARMAN (D. C.). U.S. Bur. Ent. **Benzene as a Larvicide for Screw Worms.**—*Jl. Agric. Res.*, xxxi, no. 9, pp. 885–888. Washington, D.C., 1st November 1925. [Recd. February 1926.]

From a large number of chemicals tested for the control of the larval stages of *Cochliomyia macellaria*, F., benzene was selected as the most satisfactory. Toluene and xylene were about as effective, but benzene is more easily obtainable. Chemically pure chloroform was quite satisfactory, but both this and carbon tetrachloride have a laxative effect on the wound that is undesirable. Benzene acts as a styptic, and the blood flow stops in most cases as soon as all the larvae are killed. It is not so effective in badly drained wounds, as the larvae can live submerged in the wound from 20 to 30 minutes. To prevent this the wound should be wiped dry and the benzene applied immediately. After the application the wound is dry and pale, this condition lasting from 5 to 10 minutes. A wound dressing and fly repellent that adheres to all parts should be applied, making a perfect coating that should continue the styptic effect. In no case has any injury to the tissues or any ill effect to the animal been noticed. The wound usually heals soft and dry without scabbing or cracking.

Goats, sheep, and calves are commonly infested in the mouth to such an extent that all the teeth are lost. In these cases a small amount (2 to 5 cc.) of benzene was applied so that the animal did not swallow it, and in no case was any ill effect observed. In 2,843 cases of infested animals treated with benzene under the author's personal observation only 5 died. In three of these cases the maggots had entered the body cavity, or were present in the head of the animal and had affected the nervous system.

LIESS (J.). **Ueber eine Demodexinvasion bei einer Ziege.** [An Infestation of a Goat by *Demodex*.]—*Deutsche tierärztl. Wochenschr.*, xxxiv, no. 6, pp. 93–95, 3 figs., 13 refs. Hanover, 6th February 1926.

There are few records of infestation of goats by mites of the genus *Demodex*, and in a case observed in Germany, the mites concerned probably belonged to a new species.

SCHUURMANS STEKHOVEN, jr. (J. H.). **Studies on *Hippobosca maculata* Leach and *H. equina* L. in the Dutch East Indian Archipelago.**—*Parasitology*, xviii, no. 1, pp. 35–50, 5 figs., 2 pls., 1 map, 14 refs. Cambridge, January 1926.

Some of the information contained in this paper has already been noticed [*R.A.E.*, B, xi, 109]. The pupae of *Hippobosca maculata*, Leach, first appear 12–14 days after pairing, and the pupal stage lasts on the average 25 days, the life-cycle being completed in about 38. The occasional presence of the pupae in pasture land was proved by finding starved adults in a tent placed 3 weeks previously on the ground.

Though infested horses are greatly irritated at first, they soon become accustomed to the presence of the flies. The natives ascribe the mortality among horses in the dry monsoon to the influence of this fly, and this has been confirmed by experiment. In addition to the hosts previously recorded [*loc. cit.*] dogs are very occasionally attacked and man exceptionally. The natural enemies of the fly are mites, ants, spiders and birds (*Bubulculus coromandus*).

The pupae are too scattered and inaccessible to be worth collecting. An Arab horse-breeder has been using the following primitive but efficient method of control for the past four years. Once a fortnight the unbroken horses are driven into an enclosure, out of which one horse at a time is driven into a second. Here it is lassoed and the flies dislodged from it by means of a horse-hair whip. The flies settle on another horse, which is led around the lassoed one; they are thus easily collected and thrown into boiling water. By this method 60 horses can be treated in an hour. In experiments with insecticidal fluids the best results were obtained with petroleum and Diesel oil, which killed the flies after 6 and 13 seconds respectively. Clean horses are less attractive than dirty ones, and sea bathing will keep them free from flies for two or three days. Infested animals should be dipped every two weeks until the infestation is suitably reduced, and be passed twice through the dip on each occasion [*cf. R.A.E.*, B, xii, 23]. It is not necessary to remove the flies that remain attached to the animals after dipping, as they die and drop off.

The geographical distribution and the morphology of *H. equina*, L., are briefly dealt with. This species is mainly parasitic on cattle, but in their absence, horses may be heavily infested.

WARBURTON (C.). **On Three New Species of Ticks (Arachnida, Ixodoidea),** *Ornithodorus gurneyi*, *Ixodes arvicolae* **and** *Haemaphysalis mjöbergi*.—*Parasitology*, xviii, no. 1, pp. 55–58, 3 figs. Cambridge, January 1926.

The ticks described are: *Ornithodorus gurneyi*, sp. n., from New South Wales; *Ixodes arvicolae*, sp. n., taken on water-voles (*Arvicola amphibius*) near Cambridge (possibly the female of *I. apronophorus*, Schultze [*R.A.E.*, B, xii, 118]); and *Haemaphysalis mjöbergi*, sp. n., from Borneo.

DUKE (H. L.). **A Discussion on** *Trypanosoma rhodesiense*.—*Parasitology*, xviii, no. 1, pp. 67–73, 2 refs. Cambridge, January 1926.

This paper discusses various points raised by Brumpt [*R.A.E.*, B, xii, 143] in his criticism of the author's views on the epidemiology of sleeping sickness, and points out that some of these are the result of a misunderstanding of his published works. The author maintains that Taute's conclusion of the validity of the species *Trypanosoma brucei* and *T. rhodesiense* as a result of his experiments on man [*R.A.E.*, B, viii, 46] is not comparable with the evidence accumulated at Mwanza, because the experiments were performed with *T. brucei* derived from a region where the stimulus necessary to induce it to cultivate man as a host was lacking. Recent researches show that wherever cases of *T. rhodesiense* occur, *T. brucei* is present in the fly and in the game, and it would seem that wherever game tsetses and

man are in broad contact, *T. rhodiense* will be found. In a classification of trypanosomes, based on their combined morphological and biological characters, it must be remembered that virulence and host proclivities are essentially variable physiological characters, which are not yet understood. Though natural immunity of certain species of hosts from natural infection must greatly influence the distribution of trypanosomes in nature, present knowledge concerning these facts is insufficient to justify its use as a criterion of species. Because the invertebrate host test is valueless in diagnosing the trypanosomes of fishes and amphibians, it does not follow that it is equally so for the mammalian trypanosomes and their tsetse intermediaries. In the latter this test enables a division of the parasites into three groups, which are greatly supported by morphological evidence.

Scott (R. R.). **Sanitation.**—*Tanganyika Terr.: Ann. Med. Rept.*, 1924, pp. 132–196. London, 1925. [Recd. January 1926.]

The discovery of further cases of sleeping sickness in fresh areas in Tanganyika Territory is considered ominous. Short tours along Lake Tanganyika have revealed a number of such cases, which were probably all infected by *Glossina palpalis*, and a more detailed survey would undoubtedly reveal many more. In the Mwanza infected area, there is little to add to the reports of previous years. It is estimated that between one-half and two-thirds of the whole Territory is infested with flies of the *G. morsitans* group. Two hitherto unknown foci of sleeping sickness have been discovered there during 1924, one of which lies across the main trade routes between Tabora and the south-western areas. The infected area is estimated to be approximately 10,000 sq. miles in extent. It is probable that scattered cases have occurred in the area for years, but from 1921 onwards they have been increasingly frequent. Efforts are being made to collect the natives in as fly-free areas as possible and by extending cultivation round the villages to drive the fly away from the vicinity of habitations.

In an appendix a special report is given on coconut palms as breeding-places for mosquitos, with a plan of Dar-es-Salaam. Experiments were made with small tins containing water nailed on to coconut palms at varying heights, and these were systematically examined for the presence of mosquito larvae. Although during the period of the experiment three collections of *Culex* larvae and nineteen of *Aëdes* were found in tins in the township, and some in the proximity of the trees to which the tins were attached, examination of the tins proved negative.

Jamot (E.). **La Maladie du Sommeil au Cameron.**—*Bull. Soc. Path. exot.*, xviii, no. 10, pp. 762–769. Paris, December 1925.

The distribution of sleeping sickness in Kamerun is discussed; in the northern region only *Glossina tachinoides*, Westw., occurs, and its distribution coincides with that of the disease. It is suggested that this species may be the vector, as if *G. palpalis*, R.-D., occurs at all it is very rare. The author considers that if all infected persons were traced, treated and kept under supervision, the further spread of the disease would be effectively checked.

Borel (E.). **Note sur un procédé simple pour empêcher la ponte des moustiques dans les collections d'eaux familiales indigènes.**—*Bull. Soc. Path. exot.*, xviii, no. 10, pp. 779–781. Paris, December 1925.

Though *Aëdes argenteus*, Poir., and *Anopheles vagus*, Dön., occurred in most water containers in Saigon, none were found in an old lime barrel filled with water. Experiments were therefore made with jars coated partly and entirely with thick milk of lime. Eggs were laid in the partly coated and uncoated jars, but never in those completely coated inside and out with lime, though the pH value and calcium carbonate content of the water in these jars was found not to be inhibitory to the development of the eggs. It is concluded that white repels the ovipositing females.

A note, added by E. Roubaud, suggests further investigation as to the reason for the repellent action of the lime ; it may be that some change in the microscopical flora or fauna of the water reduces its attractiveness.

Marcenac (M.). **Innocuité de** *Galeodes olivieri* **au Maroc.**—*Bull. Soc. Path. exot.*, xviii, no. 10, pp. 781–783, 1 ref. Paris, December 1925.

There has been a difference of opinion as regards the effect of the bite of *Galeodes olivieri* on man. Observations, including experimental injections of crushed portions of the body of this Arachnid into laboratory animals, have proved it to be entirely innocuous.

Tournier (E.). **Le secteur de prophylaxie du paludisme de l'Itasy (Madagascar). (2e Année de fonctionnement.)**—*Bull. Soc. Path. exot.*, xviii, no. 10, pp. 809–815. Paris, December 1925.

The present status of malaria in the region of Itasy, Madagascar, is discussed. The chief danger is the proximity of the rice-fields to human habitations. Quinine prophylaxis alone is not sufficient, but if it were supplemented by the use of mosquito larvicides and general anti-malarial measures, the disease, which is at present threatening the extinction of the Hovas, could be prevented at a comparatively low cost.

Kérandel (J.). **Riziculture et distribution géographique du paludisme en Indo-chine. Insectes prédateurs de larves de moustiques.**—*Bull. Soc. Path. exot.*, xviii, no. 10, pp. 815–821. Paris, December 1925.

Malaria shows a peculiar distribution and localisation in Indo-China. It is particularly severe in certain mountainous regions, especially in Annam and Tonkin, and practically absent from the lower valleys, where the deltas and rice-fields present large areas of stagnant water. In some of these latter districts search for two years has only revealed the presence of *Anopheles subpictus*, Grassi (*rossi*, Giles). The presence or absence of the malaria-carrying mosquitos is mainly determined by the type of rice cultivation. Where, owing to the flatness of the country, the water in the rice-fields remains unmoved for long periods, it is unsuitable for mosquito breeding, but where the rice-fields are in terraces, or where for any other reason the water is moving, even if only very slightly, mosquitos occur in

abundance and malaria is present. An easy and obvious method of preventing mosquito breeding is, therefore, to adopt a form of rice cultivation in which the water is kept stagnant.

Various fish occur in these stagnant rice-fields, but they are not sufficiently abundant to explain the absence of mosquito larvae, though a number of predacious insects, including the Dysticid, *Eretes ditiscus*, L., are important factors in controlling them.

CURASSON (G.). *Trypanosoma theileri* **au Soudan français.**—*Bull. Soc. Path. exot.*, xviii, no. 10, pp. 823–824. Paris, December 1925.

Trypanosoma theileri var. *soudanense*, n., has been isolated from cattle. Though non-pathogenic, it is found in larger numbers in diseased than in healthy animals.

LARSON (A. O.). U.S. Bur. Ent. **Further Notes on Human Suffering caused by Mites,** *Pediculoides ventricosus* **Newp.**—*Pan-Pacific Ent.*, ii, no. 2, pp. 93–95. San Francisco, Cal., October 1925. [Recd. February 1926.]

The effect of *Pediculoides ventricosus*, Newp., on man appears to vary in different individuals, both as regards severity and time of appearance. In one of the cases described the effects were noticed in as little as three hours after the attack, and in another they were so severe as to cause severe inflammation over the whole of the patient's body and arms and attacks of fever. After a week the marks of the attack were still plainly visible.

SAITO (T.). **Internal Myiasis and some Experiments on the Larva of** *S. carnaria*, **L.** [*In Japanese.*]—*Ig. Chuo Z.*, xviii, pp. 1445–1449, fig. Tokyo, 1921. (Abstract in *Jap. Jl. Zool.*, i, no. 2, p. (49). Tokyo, 1924.) [Recd. February 1926.]

Larvae of *Sarcophaga carnaria*, L., are recorded from the faeces of a patient suffering from acute intestinal catarrh.

NAGAYO (M.), MITAMURA (T.), TAMIYA (T.) & TENJIN (S.). **On the Species of Tsutsugamushi.** [*In Japanese.*]—*Ni. Byor. Gak. K.*, xi, pp. 471–473. Tokyo, 1921. (Abstract in *Jap. Jl. Zool.*, i, no. 2, p. (49). Tokyo, 1924.) [Recd. February 1926.]

The contents of this paper on *Trombicula* spp. are largely the same as those of one previously noticed [*R.A.E.*, B, x, 107].

WATANABE (G.), IZUMIKAWA (Y.) & SAITO (S.). **Studies on Piroplasmosis of the Horse.** [*In Japanese.*]—*Chuô Juikwai Z.*, xxxiv (1921), pp. 149–174, fig. (Abstract in *Jap. Jl. Zool.*, i, no. 2, p. (82). Tokyo, 1924.) [Recd. February 1926.]

Piroplasma (*Babesia*) *caballi* was isolated in May 1920 from horses of the Japanese army in Eastern Siberia. Clinical and pathological observations on the infected animals are described. *Dermacentor* (*Ixodes*) *reticulatus*, F., is considered the vector; it was abundant in the Amur district and was found on infected horses. Preventive and remedial measures for the disease are described, also the morphological and biological features of the tick.

KISHIDA (K.). **On the Systematic Position of** *Nephrophages sanguinarius*, **Miyake et Scriba, with a Note on the Scientific Name of a Mite found in Wheat.** [*In Japanese.*]—*Dobuts. Zasshi* [*Zool. Mag.*], xxxv, no. 415, pp. 203–208, 2 figs. Tokyo 1923. (Abstract in *Jap. Jl. Zool.*, i, no. 3, p. (112). Tokyo, July 1925.) [Recd. February 1926.]

As a result of examination of *Nephrophages sanguinarius* obtained from human urine, it is considered that the mite should be placed in the genus *Tarsonemus*.

BEQUAERT (J.). *Lynchia* **Weyenbergh and** *Lynchia* **Speiser are not congeneric.**—*Psyche*, xxxii, no. 6, pp. 265–277. Boston, Mass., December 1925.

There is a considerable disparity in size between *Lynchia penelopes*, Wey., the type of the genus, and other species subsequently placed by Speiser in *Lynchia*. The new name *Pseudolynchia* is suggested for the latter, of which seven species are discussed, though the author is only inclined to recognise two, the type species, *P. maura*, Bigot, and *P. brunnea*, Latr.

A translation is given of the original description *Lynchia*, which is now restricted to the type species.

MJÖBERG (E.). **A New Genus of Sucking Lice.**—*Psyche*, xxxii, no. 6, pp. 283–284, 1 fig. Boston, Mass., December 1925.

Hamophthirius galeopitheci, gen. et sp. n., is described from *Galeopithecus* sp., in British North Borneo.

WILLE (J.). **Uebersicht der landwirtschaftlich wichtigen Insekten von Rio Grande do Sul (Brasilien).** [A Survey of the Insects of Agricultural Importance in Rio Grande do Sul, Brazil.]—*Zeitschr. angew. Ent.*, xi, no. 3, pp. 415–426. Berlin, December 1925.

This list of 265 species includes the following:—Mallophaga: *Trichodectes parumpilosus*, Piag., on horses; *Lipeurus crassicornis*, Olf., *Goniodes dissimilis*, Nitzsch, and *Menopon pallidum*, Nitzsch (*trigonocephalum*, Olf.) on fowls; and *Gyropus ovalis*, Nitzsch, and *G. porcelli*, Schr., on guineapigs. Anoplura: *Haematopinus suis*, L., on pigs; *H. eurysternus*, Nitzsch, on horses; and *H.* (*Linognathus*) *piliferus*, Burm., on dogs. Diptera: *Culicoides paraensis*, Goeldi, *Tabanus bivittatus*, Wied., and *Stomoxys calcitrans*, L., biting cattle; and *Cochliomyia* (*Lucilia*) *macellaria*, F., and *Dermatobia hominis*, Say (*cyaniventris*, Macq.), infesting horses, cattle, dogs and other domestic animals. Siphonaptera: *Ctenocephalus canis*, Curt., and *Pulex irritans*, L., on dogs.

BAERG (W. J.). **The Effect of the Venom of some supposedly Poisonous Arthropods of the Canal Zone.**—*Ann. Ent. Soc. Amer.*, xviii, no. 4, pp. 471–478. Columbus, Ohio, December 1925.

This is a similar paper to one previously noticed [*R.A.E.*, B, xiii, 5], the Arthropods concerned including a centipede, scorpions and spiders.

MÜLLER (K.). **Hymenopteren-Paratyphus? Die Darmbakterien der Nahrungsmittel besuchenden Bienen, Wespen und Hummeln.** [Is Paratyphus carried by Hymenoptera? The Intestinal Bacteria of the Bees, Wasps and Bumble-bees that visit Food-stuffs.] —*Centralbl. Bakt. Paras. Infekt.*, Ite. Abt. Orig., xcvii, no. 2–3, pp. 214–218, 4 refs. Jena, 30th January 1926.

The results described here agree with those of other workers that infection with paratyphus or enteritis of Hymenoptera is not transmitted by them to man.

ROBINSON (L. E.). **The Genus *Amblyomma*.—Ticks: A Monograph of the Ixodoidea, Part IV.**—xii + 302 pp., 7 pls., 130 figs., 96 refs. Cambridge Univ. Press, 1926. [Price 20*s.* net.]

Specific descriptions are given of the 86 species of the genus *Amblyomma*, including *A. quasicyprium*, sp. n., from Mexico, the characters of the genus being described. The immature stages of very few of these ticks are known, and the material available has been rather scanty for satisfactory description of the larval and nymphal forms, so that these have not been included. A brief diagnosis embodying the salient specific characters appears as a preliminary to each description. A key is given to the species of *Amblyomma*, with a classified list of hosts and the geographical distribution of the genus. An index to all the species, with synonyms, doubtful and condemned species, is included.

The life-history of only about 10 of these species has been observed and described; so far as present knowledge goes, and except for the occurrence of parthenogenesis, there are no remarkable differences between the biology of *Amblyomma* and other genera of Ixodids. *A. rotundatum*, Koch (*agamum*, Aragão) has been found to pass through the larval or nymphal moult without detaching itself from its host. Biological notes are given on this species and on *A. maculatum*, Koch, *A. americanum*, L., *A. cajennense*, F., *A. marmoreum*, Koch, *A. variegatum*, F., *A. hebraeum*, Koch, *A. testudinis*, Conil, *A. dissimile*, Koch, and *A. tuberculatum*, Marx.

MCCALL (F. J.). [**Report of the Chief Veterinary Officer.**]—*Tanganyika Terr.: Ann. Rept. Dept. Vet. Sci. & Animal Husbandry, 1924*, pp. 1–20. Dar-es-Salaam. [1925.]

No very definite increase or decrease of the area infested by *Glossina* appears to be taking place in Tanganyika; such supposed extensions of range as are reported are probably due to the discovery of the fly in districts where it has always occurred sporadically. Grass burning and bush clearing are the ideal methods of exterminating *Glossina*, but, except in special cases, the expenditure involved does not make this method an economic one from the point of view of stock-raising, as there are large areas free from tsetse-fly available for this purpose. Fortnightly injections of tartar emetic or of tartar emetic and "Bayer 205" were not found effective in keeping cattle free from trypanosomiasis in a tsetse-fly area. An experiment in employing a large herd of goats to clear bush failed owing to the mortality among them due to crowded and unsuitable conditions. The surviving goats, divided into small groups, are, however, thriving in tsetse-fly areas, and have

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so far remained free from trypanosomiasis. The reason for the resistance of goats to the ordinary forms of trypanosomiasis is being investigated; it is not, as has been suggested, that their odour is repellent to tsetse-flies.

It appears that the spread of African coast fever in cattle is largely dependent on a moist soil and atmosphere and rich pasture, under which conditions it tends to become enzootic, while in arid, sandy country and open, closely grazed plains it tends to die out. Wherever systematic dipping has been carried out the disease has been controlled or eliminated; no case has been recorded in Dar-es-Salaam for over two years. Where dipping is not practicable, the hand-picking of ticks would be beneficial.

HORNBY (H. E.). **Third Annual Report of the Veterinary Pathologist, Mpwapwa, for the year ending 31st December, 1924.**—*Tanganyika Terr.: Ann. Rept. Dept. Vet. Sci. & Animal Husbandry, 1924*, pp. 21–33. Dar-es-Salaam. [1925.]

As a result of an investigation of the Shinyanga area, where an experiment in tsetse-fly control has been carried out [*R.A.E.*, B, xiii, 105, etc.], the author records that an unusually small percentage of tsetse-flies (*Glossina swynnertoni*, Aust.) is infected with pathogenic trypanosomes in the area, and that there is a paucity of biting flies other than tsetse-flies; consequently, the mortality among experimental animals should be low and plough oxen can be used with comparative safety for working land close to the fly belt. He considers that many cases of trypanosomiasis in domestic animals are not contracted directly from tsetse-flies, and that the study of the bionomics of other biting flies is of great importance in this connection.

The failure of African coast fever to become enzootic in the arid areas [see preceding paper] is accounted for by the fact that the intense winter desiccation is unfavourable to ticks that have dropped off the cattle, and to the incubation of their eggs; consequently tick incidence is low. Moreover, cattle density is also low in such areas, so that the chance of an infective tick, having dropped off an infected animal, finding a new bovine host is very small.

FOX (C.). **Insects and Disease of Man.**—8vo, xii+349 pp., 92 figs. London, H. K. Lewis & Co., Ltd., 1925. Price 18s. [Recd. February 1926.]

This book, which is an American publication issued with an English title-page, is designed for the use, principally, of students of medical entomology and health officers in the United States. It does not, however, deal solely with insects and diseases occurring in America, but they are treated more fully than those confined to the Eastern Hemisphere. The first of the two parts into which the book is divided deals with the classification, structure, and biology of the Arthropods of medical importance, and contains a chapter on rodents in connection with plague, including a list of the ectoparasites that have been found on rats and mice in America, and a chapter on technique. The second part is devoted to the diseases of man transmitted by Arthropods, and their prevention, and includes additional information on some of the more important insects. Malaria and plague in particular are dealt with at considerable length, the discussion of the former including

notes on all the species of *Anopheles* known or believed to be carriers of malaria in the United States, and a list of fish destructive to mosquito eggs and larvae in the United States. In the first part an important feature is the large number of keys, mainly taken, more or less unaltered, from reliable authorities. The chapter on the Siphonaptera is of considerable length, and includes a valuable original key to the genera of the order throughout the world, the type species and date of description of each being also given. Life-histories are generally given under the families, but many notes on the biology of individual species are also included. Control measures for those insects that are not especially concerned in the transmission of any one disease are included with the discussions of the insects; in the case of the insects dealt with in both parts cross-references are given. No bibliographical references are given, but there is a short list of important works dealing with the various aspects of medical entomology.

HOME (H.). **The Engineer and the Prevention of Malaria.**—8vo, x+176 pp., 43 figs. London, Chapman & Hall, Ltd., 1926. Price 13*s.* 6*d.* net.

The author's purpose is to give in a concise form a general account of modern research on malaria and of its practical application in sanitary work. The questions of the organisation of an anti-malaria campaign and the identification of the malaria vector are discussed. The value of specific sanitation against a known vector rather than general sanitation against mosquitos is urged, especially where the cost of labour and materials is high. From long and varied personal experience the author discusses the different drainage possibilities and malarial conditions in lowland country, in townships and in hill country, with notes on Anopheline breeding-places. Such anti-mosquito measures as the use of oil and larvicides and of fish are explained, with the considerations that must be taken into account in planning houses in the tropics. A chapter also deals with biological means of attacking Anophelines, and the author suggests that it may be found possible to eradicate malaria from certain places by altering the composition of the water to make it uninhabitable for some particular malaria-carrying mosquito; the possibility affords at least a chance of a new weapon against the mosquito.

Three original papers are included as appendices to this work, the subjects dealt with being mosquito netting, by W. P. MacArthur, and the organisation of a campaign against mosquitos, and notes on house-flies, by P. A. Buxton. An appendix is also added on water, including a lengthy abstract from a communication by T. T. Cocking, on pH values, and how to determine them.

Field Studies and Demonstrations in Malaria Control.—*Rockefeller Foundn. 11th Ann. Rept., Internat. Health Bd. 1924,* pp. 73–84. New York, January 1925. [Recd. March 1926.]

At the field station of malariology established at Leesburg, Georgia, in 1923, experiments showed that both *Anopheles crucians* and *A. punctipennis* exhibit a marked preference for animal blood; *A. quadrimaculatus* is the only effective transmitter of malaria in the Southern States. In Palestine, where surveys have been continued, *A. bifurcatus*, breeding in wells and cisterns, is largely controlled by oiling, and *A. elutus*, the

principal vector in rural districts, can be controlled by conservation and proper management of the available water supplies, rather than drainage. In Porto Rico it was found that in many areas malaria is most prevalent among those living in closest proximity to cane fields. While the Anopheline situation was in no two areas the same, sugar cultivation invariably seemed to produce constant and abundant opportunity for mosquito breeding. *A. albimanus*, *A. grabhami* (rare), and an occasional *A. vestitipennis* occur, the first being prolific in both fresh and brackish water, especially in pools exposed to the sun and containing some vegetation. In Haiti, the maximum breeding of *Anopheles* in the rainy season occurs in the ricefields, and when these are dry, breeding takes place in springs, seepage areas and irrigation ditches; *A. albimanus* predominates, and *A. grabhami* is found in small numbers. In Brazil, work in four areas of Rio de Janeiro justifies the conclusion that the control of malaria is feasible in the tropics through anti-mosquito measures alone in such conditions as were there encountered. Paris green was used continually on the marshy river flats; streams and ditches were cleared of the rapidly growing aquatic vegetation and protected from damage by animals. Quininisation was not found to be indispensable.

Malaria Investigations.—*Rockefeller Foundn. 11th Ann. Rept., Internat. Health Bd. 1924*, pp. 101–110, 5 figs. New York, January 1925. [Recd. March 1926.]

The study of malaria in the Southern United States has been continued during 1923 and 1924. In the warmer months, which showed a rise in malaria cases, *Anopheles quadrimaculatus* was found in large numbers; *A. punctipennis* and *A. crucians* were prevalent in the cooler months, when malaria was at its lowest point. Though there is some evidence against *A. crucians* being a malaria carrier, further data are required before either this species or *A. punctipennis* can be definitely described as non-carriers, but *A. quadrimaculatus* is undoubtedly the chief vector, and probably the only one in Georgia. Both this species and *A. crucians* choose for breeding-places still waters abundantly stocked with plankton, but *A. punctipennis* prefers to breed in and near running water or in wells, where plankton is relatively scarce. *A. punctipennis* is found in hill streams, while *A. quadrimaculatus* occurs in flat lands or in the hill country in swamps or lime sinks, or in impounded water, but with the re-establishment of the current in a stream it begins to disappear.

A definite correlation exists in Georgia between topography and malarial incidence. Where there is water of the type in which *A. punctipennis* breeds but in which *A. quadrimaculatus* is not usually found, no fatal cases of malaria are recorded; but where a few *A. quadrimaculatus* are found, a small number of deaths occur annually. One region, consisting of piney flat woods, is relatively free from severe malaria, *A. crucians* is the prevailing species, though *A. quadrimaculatus* occurs in places. *A. punctipennis* is apparently absent. In two districts there is a peculiar limestone formation in which sinks, ponds and swamps occur in large numbers. *A. quadrimaculatus* occurs very much more abundantly here than in any other region of Georgia, and this is pre-eminently the malarial region of the State.

Temperature has a decided influence on the behaviour of all stages. When the temperature of water is below 55° F. larvae go to the bottom

and remain there for long periods, but rise to the surface when the temperature becomes higher. During winter months, when the temperature ranges from 39° to 50°, larvae are mostly at the bottom in a quiescent state. They come momentarily to the surface if disturbed, so that in searching for breeding-places the bottom of the water must be stirred up and inspection made rapidly. A key is given for the differentiation of the fourth stage larvae of the three species discussed in this paper. Attention is drawn to the fact that *A. quadrimaculatus* when at rest in the adult stage has a *Culex*-like attitude, remaining almost parallel to the wall, instead of projecting from it as do *A. crucians* and *A. punctipennis*. It was found that adults of *A. quadrimaculatus* rarely fly further from the breeding ground than $1\frac{1}{2}$ to $1\frac{3}{4}$ miles, the males in particular being found generally close to the breeding-places.

The effect of standard quinine on the spleen index is discussed.

[Zarkhī (G. Ī.).] **Зархи (Г. И.). Malaria in the Narim Region.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1925, no. 1–3, pp. 21–24, 6 refs. Moscow, 1925. [Recd. February 1926.]

The topography of the country in the Narim region (western Siberia) is briefly described. *Anopheles maculipennis*, Mg., was the only mosquito found; after October it only occurred indoors, cellars being the favourite place for passing the winter. In 8 individuals examined, the number of the maxillary teeth varied from 15–19 [*cf. R.A.E.*, B, x, 53].

In the blood smears examined only *Plasmodium vivax* was found, the majority of the patients never having been beyond the region under review. During 1925 the spring outbreak of malaria began early in March, the primary cases amounting to 47 per cent., so that quinine prophylaxis should be started at the beginning of this month.

[Līndtrop (G. T.) & Khudadov (D. S.).] **Линдтроп (Г. Т.) и Худадов (Д. С.). Cases of indigenous Leishmaniasis in Baku.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1925, no. 1–3, pp. 33–35, 2 refs. Moscow, 1925. (With a Summary in English, p. 72.) [Recd. February 1926.]

Details are given of three cases of oriental sore in Baku, all in children of 12–14 years, and from all of which *Leishmania tropica* was isolated. The gecko, *Gymnodactylus caspius*, is widely distributed over the town, and *Phlebotomus* is present.

[Vasīl'ev (Ī. V.).] **Васильев (И. В.). Observations on the Malaria Mosquito (*Anopheles maculipennis*) in the Town of Izyum, Government of Kharkov.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1925, no. 1–3, pp. 41–43. Moscow, 1925. (With a Summary in English, p. 72.) [Recd. February 1926.]

The seasonal history of *Anopheles maculipennis*, Mg., in Izyum is discussed; there appear to be five generations a year, the maximum flight periods for these being respectively 1st–2nd and 25th–26th June, 17th–18th July, 12th–13th September and 6th–7th October.

A detailed account is given of the intestinal contents of the larvae.

[Rukhadze (N. P.).] **Рухадзе (Н. П.). The Question of Distribution and Biology of Anophelines in Abkhasia.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1925, no. 1–3, pp. 45–49. Moscow, 1925. (With a Summary in English, p. 72.) [Recd. February 1926.]

The bulk of this information has already been noticed from another source [*R.A.E.*, B, xiii, 113].

[Popov (P.).] **Попов (П.). A Study of the *Phlebotomus* Fauna in Azerbaijan.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1925, no. 4–6, pp. 55–56, 4 refs. Moscow, 1925. (With a Summary in English, p. 104.) [Recd. February 1926.]

Phlebotomus papatasii, Scop., *P. perniciosus*, Newst., *P. caucasicus*, Marz., and *P. li*, Popov, are recorded from Baku. The last named is a new species the description of which is still in the press. As *P. caucasicus* is nearly related to *P. sergenti*, Parrot, the probable transmitter of oriental sore, the study of its distribution in relation to the disease would be of interest.

[Veshezerov (N. Ī.).] **Вешезеров (Н. И.). The Biology of *Anopheles* of the Black Sea Coast of the Caucasus.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1925, no. 4–6, pp. 57–61, 1 ref. Moscow, 1925. (With a Summary in English, p. 105.) [Recd. February 1926.]

Anopheles maculipennis, Mg., *A. bifurcatus*, L., and *A. superpictus*, Grassi, are recorded from the region under review. The local conditions and breeding-places are described. The larvae of *A. bifurcatus* were found in the colder waters, as was to be expected.

[Demokīdov (—).] **Демокидов (—). *Anopheles maculipennis*, Mg., in the Arid Steppes of the Terek Region.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1925, no. 4–6, pp. 63–65. Moscow, 1925. (With a Summary in English, p. 105.) [Recd. February 1926.]

Anopheles maculipennis, Mg., occurred in human habitations at a distance of about 5½ miles from its nearest possible breeding-places. Individuals were caught at this distance throughout the active period of this mosquito, whereas of *A. bifurcatus*, L., and *A. hyrcanus*, Pall., only isolated ones were found, though they were plentiful near their breeding-places.

[Līndtrop (G. T.).] **Линдтроп (Г. Т.). Further Observations on the Distribution of the White Malaria Mosquito *Anopheles* (*Cellia*) *pulcherrimus*, Theo., in Azerbaijan and Biological Notes concerning it.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1925, no. 4–6, pp. 67–72, 10 refs. Moscow, 1925. [Recd. February 1926.]

The distribution of *Anopheles pulcherrimus* var. *atropotenae*, Lindt., in Azerbaijan is further discussed [*R.A.E.*, B, xii, 149]. This species is apparently distinctly attracted by light. There is a close relation between its distribution and the incidence of malaria in eastern Transcaucasia.

Reports on the Tour of Investigation in Palestine in 1925. Part I.— *League of Nations, Health Organization, Malaria Commiss.*, C.H. Malaria/52, pp. 1–34, 9 pls., 3 maps, 6 refs. Geneva, September 1925. [Recd. February 1926.]

The past and present prevalence of malaria in Palestine and the measures that have been taken to deal with the disease are reviewed. On the whole, malaria seems to have been less prevalent and less severe in the country of recent years, and particularly so in Jerusalem and in some Jewish colonies. This decline has been much more marked in the case of malignant tertian malaria (due to *Plasmodium praecox* (*falciparum*) than in that of benign tertian (due to *P. vivax*). An attempt has been made to compare the importance of the factors of rainfall and anti-malarial measures with regard to malaria incidence, and, while this cannot be definitely determined until the country has experienced further years of deficient rainfall, it seems that in towns the main reason for the decrease of the disease has been anti-malarial measures, which also play a very considerable part in country districts. The success of these measures must be ascribed to widespread application of all available means rather than to sole reliance on any particular line of action. With regard to the measures directed specifically to the destruction of mosquitos, and particularly of *Anopheles bifurcatus*, notable success has been obtained in the towns by oiling the water storage cisterns in which that species breeds. In some localities the cisterns that used to be breeding-places have ceased to be so ; enquiry into the cause of a natural change of this kind might yield useful indications for preventive action. It has been suggested that *A. bifurcatus* can thrive only in cold water, and this may account for its prevalence in underground cisterns and wells where the temperature is generally below 21° C. [69·8° F.]. The chemical reaction of the cistern water may also influence the life of this species. A search for natural enemies that might thrive in cisterns would possibly give valuable assistance in control. The stage in which *A. bifurcatus* hibernates in Palestine has not been ascertained ; in Europe only the larval stage survives the winter, and if this is the same in Palestine, intensive anti-larval measures carried out during a few days just before the end of the winter ought to result in complete eradication of the species.

As regards the rural mosquitos, rainfall in Palestine is confined to the winter months, when the temperature is too low for mosquito breeding to occur, and when the rains are over, drying occurs so rapidly during the hot, rainless summer that temporary breeding-places are almost unknown. Drainage of the few swamps that remain during the period when the temperature is favourable to breeding is not a great undertaking and has given very good results. Other measures include damming streams in ravines near their origin and releasing the water every five or ten days ; periodical drying of irrigation ditches by deflecting the flow through alternative channels ; cleaning out vegetation in ponds ; applying larvicides ; and stocking with fish.

In a series of appendices are given the Public Health Anti-malarial Ordinance of 1922, the Regulations under this ordinance, and the routine anti-malarial measures to be practised [*R.A.E.*, B, xi, 140, 141].

SWELLENGREBEL (N. H.). **Report [on the Tour of Investigation in Palestine in 1925.] Part II.**—*League of Nations, Health Organisation, Malaria Commiss.*, C.H. Malaria/52, pp. 35–66, 4 pls., 6 refs. Geneva, September 1925. [Recd. February 1926.]

The situation in Palestine with regard to malaria is reviewed, and the organisation of the anti-malarial service is described. Of the various Anophelines that occur in Palestine, the Malaria Commission of 1925 found only *Anopheles elutus*; *A. bifurcatus*; *A. multicolor*; *A. superpictus*; *A. sergenti*; and *A. hyrcanus*. *A. hyrcanus* and *A. algeriensis* have not as yet been proved to be of any importance as malaria carriers. *A. multicolor* was in one instance found in a sleeping room in Jericho. *A. elutus* was not found in the larval stage in breeding-places where *A. maculipennis* might have been expected, though it occurred in the adult stage in great quantities and was found breeding in much less likely places. Many observations in various parts of the country lead the author to the conclusion that *A. elutus* differs from *A. maculipennis* not only in its morphology (clearly shown by the scale tufts on the wings), but also in its breeding habits. The situation with regard to urban and rural Anophelism is discussed, largely from the work of other authors, whose opinions are quoted in many instances. Malaria in towns is caused by *A. bifurcatus* only, which breeds in the cisterns and in domestic water containers, and, to a less extent, in deep wells. Cesspits and latrines are troublesome as breeding Culicines, but no Anophelines (at least not in Haifa and Jaffa). *A. bifurcatus* is said to breed all the year round in the constant temperature within the wells and has only occasionally been recorded as breeding in the open. In rural districts, the principal malaria carriers are *A. elutus*, which prefers water covered with vegetation and perfectly stagnant, *A. sergenti*, found generally in seepage water or the overflow of irrigation ditches, or in small streams, and *A. superpictus*, frequently found in the seepage water from springs. *A. multicolor* breeds in brackish waters; *A. algeriensis* and *A. hyrcanus* breed in large swamps. Where *A. elutus* is the only carrier, there is one maximum incidence of malaria, in July–August; where *A. sergenti* also is present, there is a second maximum incidence in autumn, though it does not follow that this is due to the presence of the latter species. The anti-malarial measures in both urban and rural districts are discussed at length [see preceding paper], and details are given of local measures adopted.

The author estimates the factors that have contributed to bring about the very evident reduction in malaria to include natural decline of a probable post-war epidemic, return of the village population to settled conditions, intensive quinine treatment among school children, and anti-larval measures. There is a tendency to attribute most of the success to the last-named, but in the author's opinion all these factors have contributed to the result, the value of anti-larval measures being very considerable.

KLIGLER (I. J.). **Source of Malaria in Palestine.** [*In Yiddish.*]—*Harefuah*, i, no. 4–5, pp. 173–180. Jerusalem, April 1925. (With a Summary in English, pp. iv–v.)

A brief outline of the breeding-places and types of Anopheline mosquitos in rural Palestine is given.

KLIGLER (I. J.) & SHAPIRO (J. M.). **Organisation of Areas for Mosquito Control in Palestine.** [*In Yiddish.*]—*Harefuah*, i, no. 4–5, pp. 180–188. Jerusalem, April 1925. (With a Summary in English, pp. v–vi.)

In reservoirs in orange groves the fish *Tilapia* sp. has been used with great success. The most useful larvicide is kerosene mixed with crude oil in the proportion of 9 to 1, to which 1–2 per cent. of castor oil is added. Paris green was found excellent in overgrown swamps. Cresol (1–10,000 as the final concentration) was useful in gravel swamps and pools. Benign tertian malaria predominates during the spring and summer; malignant tertian occurs almost exclusively during September to December, the peak being in October.

ADLER (S.). **Parasites of** *Phlebotomus papatasii*. [*In Yiddish.*]—*Harefuah*, i, no. 4–5, pp. 211–217. Jerusalem, April 1925. (With a Summary in English, pp. ix–x.)

Most of the information contained in this paper on the possible relation of *Phlebotomus papatasii* to oriental sore has already been noticed [*R.A.E.*, B, xiii, 175].

STANKOVIĆ (S.). **Zur Kenntnis von** *Anopheles superpictus* **in Mazedonien.** [A Contribution to the Knowledge of *A. superpictus*.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxx, no. 3, pp. 104–112, 4 figs. Leipzig, 1st March 1926.

Anopheles superpictus and *A. maculipennis* are the commonest Anophelines in southern Jugoslavia, the former occurring everywhere. Captured females oviposited at night, the two individuals observed laying 296 and 262 eggs respectively. The eggs were laid on the surface in 2–3 large batches, mostly in rows of 15–30. They are readily distinguishable even by the naked eye from those of *A. maculipennis*. They are dark grey, almost black, without surface spots and are decidedly smaller and more pointed at the ends. There is no trace of float-chambers, the float apparatus being formed by a comparatively wide raft as in *A. plumbeus* (*nigripes*), two-thirds of the egg being under water. The newly-hatched larva is distinguished from that of *A. maculipennis* by the hair at the base of the antenna being forked with hooked ends, and from that of *A. bifurcatus* by the posterior clypeal hairs being simple and comparatively long, reaching almost to the tips of the lateral clypeal hairs. The pupa is also figured and briefly described; it is smaller on the average than that of *A. maculipennis* or *A. bifurcatus*. In the laboratory the life-cycle occupied about 20 days at an average temperature of 22·5° C. [72·5° F.]. In 1925 the first adults of *A. superpictus* appeared in July. In some localities this species predominates over *A. maculipennis*, even when the latter is numerous, and must be considered an important malaria carrier at the end of summer and in autumn.

BINI (G.). **Relazione sulla lotta antimalarica di Fiumicino.** [Report on the Anti-malarial Work at Fiumicino.]—8vo, 93 pp., 5 pls. Rome, Coop. Tipogr. "Castaldi," 1925.

The work done in Fiumicino since 1918 was limited at first to measures against mosquito larvae, but on this being found inadequate,

the destruction of the adults was also carried out, together with a thorough treatment of human cases. Anti-larval measures included oiling for about two-thirds of a mile around the township and raising the level of a lake, cleaning its banks and stocking it with *Gambusia* to prey on the larvae. It has been found that a census of all collections of water, including those of a domestic character, must be a preliminary to effective anti-larval work.

França (C.). **L'emploi des plantes dans le combat des moustiques.**—*Rev. méd. Angola*, iii, no. 4, pp. 419–422. Lisbon, August 1924.

The employment of suitable aquatic plants against mosquito larvae is urged [*R.A.E.*, B, xii, 178]. *Azolla pinnata* and 15 species of *Utricularia* occur in Angola.

Fontoynont (—). **Prophylaxie biologique du paludisme et des infections intestinales.**—*Congrès de la Santé publique et de la Prévoyance, Marseille, 11–17 Septembre 1922. Comptes Rendus* pp. 353–355. Marseilles, 1922.

In 1920 Père Camboué pointed out that an increase of malaria in 1904 around Antananarivo, Madagascar, coincided with the destruction, estimated at 300,000 individuals in 3 months, of the spider, *Nephile madagascariensis*, in experiments for producing silk. At a very moderate computation each spider destroys 10 mosquitos daily. The author considers the increase of *Lucilia caesar*, an imported fly in Madagascar, to be largely responsible for the increase of dysentery and other intestinal complaints. A spider that is chiefly found on oaks is an active enemy of *L. caesar*.

Balfour (A.). **Report on Medical and Sanitary Matters in Bermuda, 1923.**—Fol., 91 pp., 107 figs., 1 map, 1 chart, 1 plan. London, Crown Agents for the Colonies, 1925.

The mosquitos found in Bermuda are *Aëdes argenteus* (*aegypti*), *Culex fatigans*, and *A. sollicitans* and *A. taeniorhynchus*, two salt-marsh breeders, the larvae of which are never found intermingled. *A. sollicitans* is found in the open, especially among grass and sedge, and attacks during the day; it breeds all the year round. In the summer *A. taeniorhynchus* becomes widely dispersed and frequently enters dwellings. Pupation of these species can occur in water containing about 75 per cent. sea-water. *A. argenteus* appears to be wholly a domestic species. *C. fatigans* is the most ubiquitous of the Bermudan mosquitos, breeding both near dwellings and far away from them; in some respects it is the most important species, being possibly a carrier of dengue, which still occurs at intervals in Bermuda.

The methods hitherto adopted are those usual in anti-mosquito work, the use of fish being particularly successful. Gold-fish have proved of great value in tanks, barrels, etc., but will not survive in cisterns exposed to the summer sun, the temperature of which may rise above 100° F. In such cases an indigenous fish, *Fundulus bermudae*, is used. This readily devours mosquito larvae, but as it also feeds on vegetable matter, cisterns must be kept free from algae. The measures advocated include the reclamation of all the marshes, priority being given to those close to centres of population. Burning

over the surface with oil is not only a preliminary to the filling operation (enabling the labourers to work), but could be used as a routine temporary measure, especially in the smaller swamps. Where fish are effective, oil-burning need not be resorted to, but fish under natural conditions play a very limited rôle as controllers of mosquitos. The services of an expert field entomologist would be of the greatest value in advising on the necessary engineering work in filling operations, etc., for unless the bionomics of the particular species attacked are fully understood much needless work and expense will be incurred.

For fly prevention Baber's method of a guttered platform [*R.A.E.*, B, vii, 5; xiv, 25] should be successful for large stables while pits or bins fitted with fly-traps could be used in smaller establishments.

Bonne (C.) & Bonne-Wepster (J.). **Mosquitoes of Surinam. A Study on Neotropical Mosquitoes.**—*Kolon. Instit. Amsterdam*, Meded. xxi, Afd. Trop. Hyg., no. 13, 558 pp., 84 figs. Amsterdam, 1925. Price *fl.* 10 or $4.

This monograph is the result of the authors' decision in 1916 to work out the mosquito fauna of Surinam, on which very little had been done, and a knowledge of which is of great importance in view of the prevalence of filariasis in that country. Descriptions are given of 133 species occurring in Surinam, with short notes on all the other known species of tropical America including the Antilles, but not including Mexico. There are diagnostic tables that contain them all, as well as many keys to genera, etc. The purpose of the present monograph is to extend Howard, Dyar & Knab's work, which included the Antilles and Trinidad. Dyar's classification, based largely on the structure of the male hypopygium and on larval characters, is used, though this system is inconvenient when males are not available. The present knowledge of the hypopygial structures and especially of their homology in different genera is also so fragmentary that every classification based on them must be of a provisional character. The number of species has increased considerably, and there is a risk of recognising too many species on small details of hypopygial structure alone, just as there is danger in overestimating the value of scale characters and differences in colouration. An attempt is therefore made to base identification keys on larval as well as outer adult and hypopygial characters. The complete synonymy of each genus or species is not given, but reference is given to the original description.

Bonne (C.). **Malaria in Suriname.**—*Nederl. Tijdschr. Geneesk.*, lxviii, 2nd Half, no. 5, pp. 616–637. Haarlem, 2nd August 1924.

The Anophelines found in Dutch Guiana comprise: *Anopheles* (*Chagasia*) *fajardoi*, Lutz, *A. tarsimaculatus*, Goeldi, *A. argyritarsis*, R.-D., *A. mediopunctatus*, Theo., *A. apicimacula*, D. & K., *A. intermedius*, Chagas, *A. pseudomaculipes*, Chagas, *A. peryassui*, D. & K., *A. eiseni*, Coq., *A. nimbus*, Theo., and *A. bellator*, D. & K. Brief descriptions with keys to the larvae and adults are given. Dutch Guiana consists of a flat, marshy coastal area, a sandy savanna-region, and a hilly interior, where there is more malaria than in other parts of the country. Malignant tertian is more common in the interior than on the coast, though in certain parts benign tertian and quartan predominate. *A. argyritarsis* is the main carrier in the interior. It

is not found on the coast, where *A. tarsimaculatus* is responsible. When the latter species occurs in the interior its habits are different [*R.A.E.*, B, xii, 80]. The statement of Flu that, while there is no definite malarial season, the chances of infection are greatest shortly after periods of heavy rain, is confirmed by the author.

BARBER (M. A.) & KOMP (W. H. W.). **The Hydrogen-ion Concentration of Waters in Relation to Anopheline Production.**—*Trans. 4th Conf. Malaria Field Workers, Chattanooga, Tenn., Nov. 14–16, 1922*, Public Health Bull. no. 137 (Summarised in *Public Health Engineering Abstracts*, J.–712. Washington, D.C., 24th May 1924.)

In a large number of determinations of the hydrogen-ion concentration of water from many different natural sources in Alabama, during a period showing great variations in dryness and temperature, it was found to vary from a pH of 5·0 (ditch below certain springs) to a pH of 8·0 (overflow of artesian wells). Numerous Anophelines were found in both these extremes and in waters of nearly every intermediate grade. As all the species of *Anopheles* common in that region, *A. punctipennis*, *A. quadrimaculatus* and *A. crucians*, were found in waters of greatly varying pH, there appears to be no measurable correlation between the hydrogen-ion concentration of waters and the occurrence of any of these 3 species.

KIRBY-SMITH (J. L.). **A Consideration of Creeping Eruption in the Southern States with an Entomological Report.**—*Southern Med. Jl.*, xviii, no. 6, pp. 402–411. Birmingham, Ala., June 1925.

The parasite causing the creeping eruption connected with moist sand has been identified as a minute Nematode.

FERRELL (J. A.). **The Malaria Problem in the South.**—*Southern Med. Jl.*, xviii, no. 6, pp. 432–434. Birmingham, Ala., June 1925.

The distribution, incidence and severity of malaria throughout the United States have steadily declined since the Civil War, the factor of greatest importance in this connection being drainage for the purpose of reclaiming land for agricultural purposes. In the South *Anopheles quadrimaculatus* is the only species transmitting malaria under natural conditions, and measures should be concentrated upon it.

WALCH (E. W.). **Some Remarks on the Malaria of the Dutch East Indies.**—*Southern Med. Jl.*, xviii, no. 6, pp. 434–438. Birmingham, Ala., June 1925.

Some 20 species of Anophelines occur in the Dutch East Indies, of which only 3 or 4 are now considered of importance as carriers of malaria, *Anopheles ludlowi* being the species most feared. Others, usually practically harmless, are responsible for epidemics under certain conditions difficult to define. Among these are *A. hyrcanus* (*sinensis*) and *A. kochi*. *A. hyrcanus*, until recently ignored as a carrier,

especially of malignant tertian, has been found responsible for two epidemics. This may be due to an occasional preference for human beings, or to there being two varieties of *A. hyrcanus* of different susceptibility, those in the epidemics mentioned being of the *vanus* type. The value of catching adult mosquitos is considerable. In the first epidemic a catch of 6,000 per month rose to 33,000 when the whole population of 800 was armed with catch tubes of bamboo. In the second epidemic intensive catching was at once instituted and a substantial drop in the number of Anophelines rapidly occurred. In the Dutch East Indies there is a general tendency to believe in the protective rôle of cattle, buffalos being usually employed for diverting Anophelines away from man.

King (W. V.). **Entomological Research in Malaria.**—*Southern Med. Jl.*, xviii, no. 6, pp. 444–446. Birmingham, Ala., June 1925.

This is a survey of work done in various parts of the world, and particularly in the United States.

Darling (S. T.). **Entomological Research in Malaria : Discussion on the relative Importance in transmitting Malaria of *Anopheles quadrimaculatus*, *punctipennis* and *crucians* and Advisability of differentiating between these Species in Applying Control Measures.** —*Southern Med. Jl.*, xviii, no. 6, pp. 446–448 & 452–456. Birmingham, Ala., June 1925.

This is a review of recent work on malaria in the southern United States, particularly Georgia, much of which has already been noticed [*R.A.E.*, B, xiv, 52].

Investigation of the hydrogen-ion concentration of waters shows that a larger proportion of *Anopheles crucians* is taken from waters that are sub-acid, while *A. punctipennis* prefers waters that are very slightly alkaline. *A. quadrimaculatus* is mostly found in waters more nearly neutral. During the warmer months the relative number of males to females appears to diminish directly with the distance from the breeding-place, a fact that is helpful in searching for such places. In general, the males occur near the breeding-place, such as under bridges (*A. punctipennis*), under culverts (*A. crucians*) and in tree-holes (*A. quadrimaculatus*). The feeding habits investigated by means of the precipitin test gave results in keeping with those ascertained for *A. quadrimaculatus* by King & Bull [*R.A.E.*, B, xi, 207 ; xii, 43]. Of 236 *A. crucians*, 157 had fed on cattle, 33 on pigs, 30 on horses, 11 on dogs, 2 on fowls, and only 3 on man. Of 272 *A. quadrimaculatus*, 88 had fed on man ; of the remainder 130 had fed on cattle, 41 on pigs, 7 on horses, 4 on dogs, and 2 on fowls. All of 10 *A. punctipennis* had fed on animals. Catches of adult females showed that *A. quadrimaculatus* is found inside and under houses ; *A. crucians* under houses, under culverts and in outbuildings, but rarely or never inside habitations ; *A. punctipennis* in animal quarters, outbuildings, and under bridges, trees and other shelters out of doors. *A. punctipennis*, while preferring animal blood, may attack man, particularly near streams. *A. quadrimaculatus* is distinctly fond of human blood and commonly enters houses at night through windows, doors or chimneys.

LE PRINCE (J. A.). **Feasibility of advocating Building Designs or Regulations in Reference to Mosquito Control.**—*Southern Med. Jl.*, xviii, no. 6, pp. 465–466. Birmingham, Ala., June 1925.

Properly applied publicity is suggested as the best method of creating a public demand for houses that can be kept mosquito-proof.

SÉGUY (E.). **Faune de France. 12. Diptères (Nématocères piqueurs) : Ptychopteridae, Orphnephilidae, Simuliidae, Culicidae, Psychodidae Phlebotominae.**—8vo, 109 pp., 179 figs., 12 pp. refs. Paris, Paul Lechevalier, 1925. Price *Fr.* 15. [Recd. February 1926.]

This work is designed to assist the identification of the blood-sucking Nematocera other than the Ceratopogonines found in France and some neighbouring countries. A general description is given of the Simuliids and Culicids, with keys to, and descriptions of the species, and an account of the parasites and protozoa found in them. Similar notes are given on the French species of *Phlebotomus*, but a complete study of the Psychodids is impossible owing to lack of material.

BLACKLOCK (D. B.). **The Development of *Onchocerca volvulus* in *Simulium damnosum*.**—*Ann. Trop. Med. & Parasit.*, xx, no. 1, pp. 1–48, 4 pls., 10 figs. Liverpool, 11th February 1926.

In the Konno district of Sierra Leone the occurrence of subcutaneous nodules caused by *Onchocerca volvulus* is common in man, and the larvae of this Nematode also occurred in the skin of 45 per cent. of natives examined systematically, being found most commonly in the region of the waist. No evidence was found indicating a connection between diseases of the eyes or defective vision and infection with *O. volvulus*. In some cases the larvae were found in the skin, but not in the nodules, in others they were found in both skin and nodules ; but in no case did puncture of a nodule give a positive result when larvae were not found in the skin.

The fact that many individuals whose skin was heavily infested with *O. volvulus* had no larvae in their blood made it seem probable that if any blood-sucking Arthropod was the vector of the Nematode it was one that had to rasp and tear the skin in order to reach the blood, thus dislodging larvae that would then be ingested with the blood. The lesions made in the skin by *Auchmeromyia luteola*, F. (Congo floor maggot), and by *Simulium damnosum*, Theo., which was abundant beside small streams in December 1923 and January 1924, causing considerable annoyance, are of this nature. Numerous individuals of these species were examined for the presence of *O. volvulus* in the gut, with negative results. The investigation was resumed in 1925, and larvae morphologically identical with those of *O. volvulus* were found in the gut of 2·6 per cent. of 780 *S. damnosum* examined, and in the thorax of over 1 per cent. of 1,320. The Nematodes found in the thorax were developmental forms ; none was found in the heads of 1,140 *S. damnosum* dissected, although one was partly embedded in the head and partly in the thorax. As there was no conclusive evidence that the Nematodes found in the flies were *O. volvulus*, examinations were made of the cutaneous blood of numerous natives, by day and by night, and of domestic animals, also of the skin of domestic animals, for the presence of other microfilariae.

Filaria bancrofti was found to be present in a fair proportion of the population, one parasite being found at noon ; no other microfilaria was found in man, and none in sheep and goats. It thus appeared that the Nematode larvae occurring in *S. damnosum* must be either *O. volvulus* or *F. bancrofti*. Specimens of *S. damnosum* were allowed to feed on heavily infected areas of the skin of persons known to be infected with *O. volvulus*, but free from any other filarial infection. As a result, in one experiment, 80 per cent. had Nematodes in the gut, and in another nearly 82 per cent. exhibited infection of the thorax 7–10 days after the infecting feed, after which no fly survived.

Glossina palpalis captured on an infected person was found to have larvae of *O. volvulus* in the gut on two occasions, but, although the flies were dissected within an hour of feeding, the Nematodes appeared to be already dead. A new species of *Tabanus*, which is seldom allowed to bite by the natives, was examined with negative results. The stages of *O. volvulus* observed in man and in *S. damnosum* are described. It is presumed that the changes in developmental forms in the latter are brought about by ecdysis, the process of which was probably observed once.

The adults of *S. damnosum* are active from about 6 a.m. to 6 p.m., particularly on dull days ; in bright sunshine they rest in the shade of long grass, and will not travel more than a yard or two to bite. Considerable difficulty was experienced in keeping the flies alive ; none could be induced to bite the human skin in captivity. Flies allowed to feed undisturbed on the human skin completed their meal in 1½–5 minutes, most of the time being taken in reaching the blood level. In flies dissected in ½–6 hours after feeding, the ingested blood was always found in the mid-gut, never in the thin membranous organ that apparently corresponds to the food reservoir of tsetse-flies. Two flies were observed to engorge on goats. In flies that had not fed the ovaries failed to develop, but in fully engorged females they developed rapidly, their increase in size being proportionate to the decrease in the blood in the gut.

The prevalence of *S. damnosum* is shown by the fact that as many as 80 females may bite one person in 4 hours under favourable conditions. No males were captured. The flies are found chiefly on the banks of streams and rivers and on the wet rice farms, where labourers are very liable to be bitten. People bathing in the river are not frequently bitten, but those standing on the edge suffer severely. The latrines are generally on the edges of small streams, and are consequently in situations where the fly is prevalent.

BLACKLOCK (D. B.) & EVANS (A. M.). **Breeding Places of Anopheline Mosquitos in and around Freetown, Sierra Leone.**—*Ann. Trop. Med. & Parasit.*, xx, no. 1, pp. 59–84, 1 pl., 1 map, 10 figs., 15 refs. Liverpool, 11th February 1926.

The numbers of Anophelines present in Freetown have been very greatly reduced in the last 25 years. Eight species were found breeding in the town or its neighbourhood. *Anopheles gambiae*, Giles (*costalis*, Theo.) is still by far the commonest species in the town itself [*cf. R.A.E.*, B, x, 62], its chief breeding-places being in and near the courses of the four streams that flow through it. During the heavy rains shallow laterite drains in streets that have no slope are also important sources of the larvae, which were not, however, found

in small artificial receptacles, such as tins. The breeding-places are almost invariably so situated as to receive a considerable amount of sunlight; large numbers of larvae were found both in the presence and absence of vegetation, as well as in both clear and discoloured water. Larvae of *A. funestus*, Giles, were found once in the town, in a small, unshaded pit in laterite, containing sticks, and twice near the town, in a shallow, partly shaded stream containing a small amount of vegetation, and among weeds at the edge of a rapidly flowing river, where the water was more than a foot deep, and only slightly shaded. *A. rhodesiensis*, Theo., occurred sparsely over a wide area in and about the town in a great variety of breeding-places, including water lying in hollows in large flat stones, exposed to the sun, in the hills. Larvae of *A. smithi*, Theo., were abundant, especially from the middle of May to the end of July, in the rocky parts of two streams where they were shaded by overhanging trees. In the height of the rains larvae could only be found in pools or eddies cut off from the main currents of the streams. Larvae of *A. marshalli*, Theo., var. *freetownensis*, Evans, were found outside the town, in streams, usually in shaded situations. Larvae of *A. squamosus*, Theo., were found in a shallow, unshaded pool in a slow-running ditch in laterite, containing some vegetation. *A. theileri*, Edw., was found breeding in four localities, once in association with *A. rhodesiensis* and once with that species and *A. marshalli* var. *freetownensis*. A single specimen, reared from a pupa taken in a roadside ditch, was probably *A. domicolus*, Edw.

Numerous small collections of water in tree-holes, axils of leaves, bamboo, pineapple, and banana stems were examined, and although many contained mosquito larvae, none contained Anophelines. Owing to the closure of wells in Freetown they are no longer available as breeding-places for *A. gambiae*, as was the case in 1913.

A key to the fourth stage larvae of the first seven of the above species and *A. mauritianus*, Grp., which is also found in Sierra Leone, and descriptions of the larvae of *A. smithi* and *A. marshalli* var. *freetownensis*, with notes on the characters of the larvae of the other five species found, are given. The larva of *A. obscurus*, Grünb., probably resembles that of *A. umbrosus*, Theo., of which it is the West African form. A description is also given of one of a number of larvae, almost certainly of *A. nili*, Theo., taken in eastern Sierra Leone.

EVANS (A. M.). **Notes on Freetown Mosquitos, with Descriptions of New and Little-known Species.**—*Ann. Trop. Med. & Parasit.*, xx, no. 1, pp. 97–108, 1 pl., 3 figs., 8 refs. Liverpool, 11th February 1926.

A list is given of 41 species and varieties of non-Anopheline mosquitos collected in and around Freetown, Sierra Leone, mainly as larvae occurring in tree-holes and similar places, during the investigation recorded in the preceding paper. The situations in which larvae of 12 of the commonest species were found are shown in tabular form. Hitherto two distinct species have been included under the name *Aëdes* (*Aëdimorphus*) *apicoannulatus*, Edw.; the larva of *A. apicoannulatus*, which is the commonest tree-hole breeding mosquito in Freetown, is described, and the second species is described as *A.* (*A.*) *occidentalis*, sp.n., the characters distinguishing both the adult and the larva from those of *A. apicoannulatus* being given [in the table on p. 102 the names have been transposed]. The larva of *A. occidentalis* has been fully

described by Ingram and Macfie, as *Ochlerotatus apicoannulatus* [*R.A.E.*, B, vi, 38]. The adult female, pupa, and larva of *Megarhinus* (*Toxorhynchites*) *aeneus*, sp.n., from tree-holes, and the adult male and female of *Anopheles smithi*, Theo. (*pallidopalpi*, Theo.), are described.

ADLER (S.) & THEODOR (O.). **The Mouth Parts, Alimentary Tract, and Salivary Apparatus of the Female in** *Phlebotomus papatasii*.—*Ann. Trop. Med. & Parasit.*, xx, no. 1, pp. 109–142, 7 pls., 3 figs., 8 refs. Liverpool, 11th February 1926.

This study was made in Palestine, where *Phlebotomus papatasii*, Scop., is the commonest sandfly. The method adopted was the observation of the mouth-parts *in vivo*, dissection, and serial sections of the head. For observation of the mouth-parts *in vivo* the sandfly is lightly anaesthetised with ether so that it remains motionless for about ten minutes, during which time the mouth-parts are usually working actively. Contrary to the experience of Patton & Cragg and of Waterston the authors found that it was unusual to find blood or blood-stained fluid in the oesophageal diverticulum at any time. In the few cases in which blood was found it was in negligible quantities compared with the amount in the midgut. In insects killed a few days after a feed the oesophageal diverticulum is usually distended with perfectly clear fluid. The structure of the cardia, or upper part of the midgut, bears an interesting relation to the development of *Herpetomonas*; the epithelium bears numerous thin, transparent rods, which resemble cilia, except that they are not motile or contractile. The authors, in a series of experiments in which 155 specimens of *P. papatasii* were fed on oriental sores, found that, in nine out of the sixteen cases in which the flies became infected, flagellates attached themselves to the wall of the cardia, in some cases as early as the third day. The parasites bore into the epithelium with their flagella, which lie entangled among the rods projecting from the epithelial cells. Division of the flagellates takes place principally in the cardia, particularly in the anterior end, which is found in artificial and, in some cases, in natural infections to be completely choked up by a mass of flagellates. The cardia is not distensible, in marked contrast to the second part of the midgut, i.e., the stomach.

KAHAN SINGH. **A Further Note on Surra Transmission Experiments with Ticks.**—*Dept. Agric., Punjab*, Vet. Bull. 16 of 1925, 8 pp. Lahore, 1925. [Recd. February 1926.]

Further experiments have been made with *Ornithodorus crossi*, Brumpt, and *O. lahorensis*, Neum., in connection with the transmission of surra in camels [*R.A.E.*, B, x, 63; xi, 116]. *O. crossi* fed on an infected animal showing trypanosomes in its peripheral blood transmitted the disease up to 205 days after feeding, and up to 212 days after feeding on animals without peripheral infection.

In the case of *O. lahorensis* only one positive result was obtained, 20 days after feeding on animals without trypanosomes in the peripheral blood.

Wilkinson (D. S.). **Entomological Notes.**—*Cyprus Agric. Jl.*, xxi, pt. 1, pp. 10–12. Nicosia, January 1926.

Argas persicus, Oken, is recorded from Cyprus on chickens, and *Haemaphysalis* sp., on a snake.

de Azevedo Marques (L. A.). **As baratas domesticas, seus habitos e os meios de combatel-as.** [Domestic Cockroaches, their Habits and the Methods for combating them.]—*Bol. Minist. Agric. Ind. e Comm.*, xiv (ii), no. 5, pp. 642–645, 1 pl. Rio de Janeiro, November 1925. [Recd. February 1926.]

Periplaneta australasiae, F., and *Blattella* (*Phyllodromia*) *germanica*, L., are the commonest cockroaches in Brazil, both being imported pests. A brief description of their life-histories is given, and the use of poison-baits for them is advocated.

[Golov (D. A.) & Ioff (I. G.).] **Голов (Д. А.) и Иофф (И. Г.). The Rôle of Fleas of the Earless Marmot in the Epidemiology of Plague.** [*In Russian.*]—*Rev. Microbiol. & Epidemiol.*, iv, no. 4, pp. 19–48, 1 fig., 2 pls., 1 p. refs. Saratov, 1925. (With a Summary in French, pp. 131–137.) [Recd. February 1926.]

Previous work on the transmission of plague by fleas is reviewed. The author's observations were made on fleas occurring on *Citellus mugosauricus* in south-eastern Russia. The technique employed throughout the work is described. Three species of fleas were common on these rodents in the Transvolga region, *Ceratophyllus tesquorum*, Wagn., *Neopsylla setosa*, Wagn., and *Ctenophthalmus breviatus*, Wagn. (M.S.). Experiments were made with all three species to induce them to feed on man; they were not successful with *C. breviatus*, but the other two species fed readily.

Pulex irritans, L., *Ctenocephalus canis*, Curtis, and *C. felis*, Bch., fed readily on the rodents.

The fleas occurring on the rodents become infective with plague within 24 hours of feeding unless the rodent shows a very low infection, in which case they may not show infection until the 4th–6th day or at the latest on the 12–14th day. The plague bacilli gradually increase in the flea and completely fill the digestive tract. In some cases the insects would cease feeding and regurgitated droplets containing bacilli could be seen on the proboscis. Under experimental conditions some of the fleas died after 41–79 days, being still infective, while others were still alive at the time of writing. The actual duration of the infective period in the flea has therefore not been definitely ascertained. Most of the experiments were carried out with *Ceratophyllus tesquorum*.

Laboratory animals were easily infected by means of the excreta of the fleas, either by scarification or subcutaneous injections; the virulence of the excreta lasted for 2½ months after infection. The disease is also produced in healthy marmots by the bites of the fleas and by mechanical means [*R.A.E.*, B, ii, 60].

[Ïoff (Ï. G.).] **Иоффъ (И. Г.). Material on the Study of the Ecto-parasite Fauna in the South-east of Russia.** [*In Russian.*]—*Rev. Microbiol. & Epidemiol.*, iv, no. 4, pp. 53–75, 1 p. refs. Saratov, 1925. (With Summary in English, pp. 138–140.) [Recd. February 1926.]

The organisation of systematic collecting of ectoparasites in south-eastern Russia (including both banks of the Volga and Ural rivers) and the instructions given to collectors are discussed.

Pulex irritans, L., occurs anywhere associated with man and readily attacks domestic animals, particularly dogs, on which it appears to replace *Ctenocephalus canis*, Curt., in the Kirghiz steppes. The latter occurs mainly in towns and villages and readily attacks man, while *C. felis*, Bch., is more closely associated with its primary host, the cat, and is found less frequently on other animals.

Amphipsylla contigua, Jord. & Roths., was found in the province of Uralsk on dogs during the winter.

[Pavlovskiĭ (E. N.).] **Павловский (Е. Н.). Instructions for Collecting, Studying and Preserving Mosquitos.** [*In Russian.*]—*Rev. Microbiol. & Epidemiol.*, iv, no. 4, pp. 77–118, 18 figs., 28 refs. Saratov, 1925. (With a Summary in English, p. 141.) [Recd. February 1926.]

This paper includes instructions for making the simple equipment necessary for collecting, preserving and studying mosquitos, as well as notes on the various points to be observed during such work.

Buchanan (G.). **La faune des rongeurs et de leurs parasites cutanés qui interviennent dans la propagation de la peste.**—*Bull. Office internat. Hyg. publ.*, xvi, no. 11, pp. 1392–1406 ; xvii, no. 5, pp. 482–493. Paris, November 1924 & May 1925.

These papers include a list of the fleas found on British rats and a list of the 80 species of fleas (based on the Rothschild collection) known to occur on rats in different countries. *Xenopsylla cheopis* is probably the most dangerous from the plague aspect. It is the most prevalent rat-flea in Palestine, Iraq, the Gold Coast and Zanzibar. *X. astia*, which is believed to harbour the plague bacillus, generally without transferring it to man, is the commonest in Ceylon. It is also found at Dar-es-Salaam and at Accra. *X. brasiliensis* appears to be the most prevalent rat-flea in Nigeria, Uganda and Kenya, and also occurs at Accra. It seems able to transmit plague to man, and near Nairobi it was the only flea found on black rats in a plague-infected district.

Lasnet (—). **Note contenant, en ce qui concerne l'Indochine, des renseignements sur la faune des rongeurs et de leurs parasites cutanés, sa répartition topographique et ses rapports avec les manifestations pesteuses.**—*Bull. Office internat. Hyg. publ.*, xvi, no. 11, pp. 1407–1414. Paris, November 1924.

There are endemic foci of plague in South Annam, in Cochin China and in Cambodia. The information given on the animal reservoirs of plague and their ectoparasites has already been noticed [*R.A.E.*, B, iii, 97 ; v, 50 ; xi, 111 ; xii, 125].

TSURUMI (Mitsuzo). **Les espèces de rongeurs et de parasites cutanés propagateurs du bacille de la peste au Japon.**—*Bull. Office internat. Hyg. publ.*, xvii, no. 5, pp. 494–505. Paris, May 1925.

In Japan plague-infected rats are chiefly house-rats. The fleas that occur in Japan are: *Pulex irritans*, usually found on man and rarely on rats; *Ctenocephalus canis* and *C. felis*, often on rats; and the rat-fleas, *Ceratophyllus anisus*, *C. fasciatus*, found throughout Japan, *C.* (*Paradoxopsyllus*) *curvispinus*, peculiar to Japan, *Xenopsylla cheopis*, comparatively rare, but occurring in sea-ports, particularly during a plague epidemic, and *Leptopsylla* (*Ctenopsylla*) *musculi*.

DAVIS (C. N.). **Report of Commissioner of Public Health, 1924. Shanghai Municipal Council.**—56 pp. Shanghai, 1925.

On rats caught alive in the epidemic foci of plague, the fleas found were *Ctenopsylla*, 49 individuals; *Ceratophyllus*, 20; and *Xenopsylla*, 14. Of the rats caught *Mus rattus* formed 70 per cent. of the total.

BLAZY (—). **La faune des rongeurs et de leurs parasites cutanés qui interviennent, au Sénégal, dans la propagation de la peste; sa répartition topographique, ses variations et ses rapports avec les manifestations pesteuses.**—*Bull. Office internat. Hyg. publ.*, xvi, no. 12, pp. 1483–1502. Paris, December 1924.

The conclusions reached in this paper on rats, fleas and plague in Senegal are the same as in one already noticed [*R.A.E.*, B, xiii, 35].

CARPENTER (G. D. H.). **Speke's Tragelaph on the Sese Isles of Lake Victoria. With an Appendix by** PROF. E. B. POULTON.—*Proc. Zool. Soc. Lond.*, 1925, pt. iv, pp. 1423–1430, 1 map, 1 pl. London, January 1926.

The intimate relation between *Glossina palpalis*, R.-D., and the situtunga was fully described in a paper by Fiske [*R.A.E.*, B, viii, 131]. For nearly 20 years this antelope has been flourishing undisturbed on these islands, during which time it has changed considerably both as regards morphology and habits and has completely destroyed the undergrowth in the forests. This destruction has had a marked effect on the insects, including the tsetse-flies; whereas *G. palpalis* was formerly abundant, as many as 36 being caught by a fly-boy in an hour in March 1912, now only 10 are caught under the same conditions.

DAVEY (J. B.). **The Sleeping Sickness Outbreak in Mwanza District.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xix, no. 5–6, pp. 336–338, 4 refs. London, January 1926.

The author further disagrees with Swynnerton [*R.A.E.*, B, xiii, 114] and quotes extensively from Jack's reports [*R.A.E.*, B, xi, 140; xii, 65] to support his view that the destruction of game would reduce the prevalence of *Glossina* without necessarily forcing it to concentrate on man.

He thinks that the results that would be achieved in Mwanza would approximate to those attained in the Rhodesian experiment [which, however, has since been practically abandoned as unworkable, *cf. R.A.E.*, B, xiii, 149].

Fourche (J. A.). **Société Internationale forestière et minière du Congo. Rapport de la Mission contre la Maladie du sommeil, mai 1923 à mai 1925.**—*Ann. Soc. belge Méd. trop.*, v, no. 2, pp. 215–247, 11 pls. Brussels, January 1926.

A study has been made of the situation with regard to sleeping sickness in the Kasai region of the Belgian Congo. *Glossina palpalis* infests all the water-courses, being especially numerous in the forest belts beside the rivers. The disease occurs irregularly throughout the territory, being most common in the east, whence it has been imported, the percentage of infection for the whole region being 2·8. *Trypanosoma gambiense* is invariably the form found, *T. rhodesiense* not having been observed. Besides regular treatment of infected persons, attempts have been made to control the movements of natives and to effect clearings and remove villages from heavily infested areas. As a result of the campaign, the spread of the disease westward has practically been stopped ; the population is now under control and is willing to receive treatment, and it is hoped that within two or three years the epidemic will be stamped out.

Report of the Tsetse-Fly Conference held at Kaduna, September, 1925.—[Nigeria :] *Sess. Paper No. 1 of 1926*, 45 pp. Lagos, 1926.

This is a summary of the proceedings of a Conference to discuss practicable measures for checking the growing prevalence of tsetse-flies [*Glossina*] and the spread of sleeping sickness in the Northern Provinces of Nigeria. It includes, in the form of appendices, the following papers, which were circulated to members previous to the conference : Summary of the work of the tsetse investigator, by Ll. Lloyd ; Outline of a scheme for a proposed clearing in the Katagum area, by Ll. Lloyd ; The problem of the tsetse-fly, by C. F. M. Swynnerton ; An extract relating to tsetse-fly taken from the report of the East African Parliamentary Commission ; a Memorandum on tsetse-fly control and forestry ; and a paper by Johnson and Lloyd dealing with the tsetse-fly problem in Nigeria and their proposals for dealing with it. Dr. Adam, in opening the conference, drew attention to the success that had attended the work in East Africa, where the aim was to cut a large fly area into two and to deal with the sections piecemeal by various methods, such as expansion of farming and cattle ranching, and also emphasised the need for co-operation both of departments and of individuals. Dr. Lloyd remarked that in Nigeria the 50-in. rainfall limit might be considered the dividing line of two sorts of conditions ; south of this line tsetse-fly were practically continuous, while north of it they were to be found chiefly on the waterways. The general aim was to eliminate *Glossina morsitans* and *G. tachinoides* completely in the north and as far as possible to stop the spread of sickness in the south. Sleeping sickness was undoubtedly on the increase, isolated farms, mines and railway construction being partly the cause. He considered that the most effective method of achieving the object in view was clearing the bush ; game extermination had proved to be impracticable and was impossible except by settlement. The Director of Forests (H. N. Thompson) urged the necessity for thorough clearing along the line of the more important roads, fords and ferries, and expressed the opinion that once the game were cleared out of some of the more suitable forest reserves the latter could be opened with advantage to cattle grazing. Late grass burning, although

perhaps an inevitable remedy, he considered difficult to ensure. Bad methods of cultivation in the drier areas cause deterioration of the soil, and this, combined with the proposed late burning of grass would, he thought, ruin large tracts of country in the Northern Provinces. There should, therefore, be a thorough investigation into the methods of grass burning so as to cause as little damage to agricultural and pastoral interests as possible.

The Conference was unanimous as to the importance of getting the main trade routes cleared.

YOUNG (W. A.). **Annual Report of the Medical Research Institute, Accra, from April 1st, 1924, to March 31st, 1925.**—*Gold Coast: Rept. Med. & Sanit. Dept., 1924–25*, pp. 42–60. Accra [1925].

A summary is given of the investigation of tsetse-flies and trypanosomiasis in Ashanti in December 1924, which has already been noticed [*R.A.E.*, B, xiii, 161]; the tsetse-fly previously recorded as *Glossina medicorum*, Aust., has since been identified as *G. fusca*, Wlk.

Bubonic plague broke out in several places in 1924 and was chronic among rats in Accra, where, however, no human case occurred. The rats in Accra, Kumasi, and Sekondi seem to have developed a high natural resistance to plague. In Accra the predominant flea on *Mus rattus*, *M. decumanus*, and *Cricetomys gambianus* is *Xenopsylla aequisetosa*, End., although *X. cheopis*, Roths., was also found on *M. rattus* and *C. gambianus*, and *Ctenocephalus felis*, Bch., on the latter. It is thought possible that the rat flea is not the only vector of plague, and that there may be a direct vector from man to man. The absence of human plague from Accra may have been due to the fact that *X. aequisetosa* is not a vector. The occurrence of a *Leptospira* in tap water in Accra is described by Dr. A. S. Burgess. Examinations of large numbers of rats for the presence of *L. icterohaemorrhagiae* were all negative.

OTWAY (A. L.). **A Method of Excreta Disposal in the Tropics which entirely prevents Fly Dissemination.**—*Gold Coast: Rept. Med. & Sanit. Dept., 1924–25*, pp. 75–79, 4 pls. Accra [1925].

This paper on the construction of excreta pits fitted with fly traps has already been noticed from another source [*R.A.E.*, B, xiv, 25]. The diagrams here given are on a larger scale than those previously published and include two additional ones.

STILES (C. W.) & HASSALL (A.). **Key-Catalogue of the Protozoa reported for Man.**—*U.S. Publ. Health Serv.*, Hyg. Lab. Bull. 140, 67 pp. Washington, D.C., 1925. [Recd. February 1926.]

The species of Protozoa parasitic in man are given under the genera with notes on the transmitting agents and the alternate hosts.

WÜLKER (G.). **Zur Biologie der Lausfliegen der Vögel und ihrer Rolle als Protozoenüberträger.** [A Contribution to the Biology of the Diptera parasitic on Birds and to their Rôle as Carriers of Protozoa.]—*Senckenbergiana*, vii, no. 6, pp. 224–234, 1 fig., 28 refs. Frankfort on M., 3rd November 1925. [Recd. February 1926.]

This is a summary of the information on the subject with many references to the literature. Examination of birds' nests, particularly

those of crows, jackdaws and nutcrackers, shows that *Ornithomyia* spp. emerge in spring either immediately before or during the breeding period of birds in April and May. They thus have excellent opportunities for feeding on both the parent birds and the nestlings. This alternation in hosts favours the development and transmission of Haemosporidia.

Hine (J. S.). **Tabanidae of Mexico, Central America and the West Indies.**—*Michigan Univ. Occas. Papers Mus. Zool.*, no. 162, 35 pp. Ann Arbor, Mich., 30th July 1925. [Recd. February 1926.]

This paper is not intended to give an exhaustive study of the species known from the region indicated, but to record notes and descriptions that should facilitate further work. Numerous keys are included, and the following new species are described: *Erephopsis schildi* from Costa Rica; *Chrysops willistoni* from Guatemala; *C. melaenus* from Panama, Venezuela and Costa Rica; *Tabanus claurensis* and *T. jilamensis* from Honduras; *T. bifloccus* from Cuba, the West Indies and San Domingo; and *T. gracilicornis* from Cuba. *T. quinquepunctatus*, n. n., is proposed for *T. quinquemaculatus*, Hine nec Wied.

Galli-Valerio (B.). **Beobachtungen über Culiciden, nebst Bemerkungen über Tabaniden, Simuliden und Chironomiden.** [Observations on Culicids, with Remarks on Tabanids, Simuliids and Chironomids.]—*Centralbl. Bakt. Paras. Infekt.*, Ite Abt. Orig., xcviii, no. 1–2, pp. 97–99. Jena, 1st March 1926.

This paper contains numerous notes on the habits and breeding-places of mosquitos and other blood-sucking flies in Switzerland in 1924–25 on the same lines as in previous years [*R.A.E.*, B, xiii, 80]. The experience of the winter of 1925 proves once more that drought cannot destroy mosquitos so long as some breeding-places remain.

Observations on *Aëdes pullatus* var. *jugorum* (*gallii*) showed that the adults do not travel far from their breeding-places, though they readily bite man. During the summer a water beetle, *Agabus solieri*, was seen feeding on the pupae of this mosquito. Eggs of *A. argenteus* (*Stegomyia fasciata*) despatched from Cuba on 16th April 1925 and placed in water of 25° C. [77° F.] on 30th April yielded adults on 19th May. Another batch, in water of 22° C. [71·6° F.], required 50 days.

As regards Simuliids, *Simulium gallii* was very rare in 1925 in Alpine meadows. In June and July *S. ornatum* proved very annoying at Lausanne.

Root (F. M.). **Notes on Blood-sucking Arthropods collected at Tela, Honduras, and Port Limon, Costa Rica, during the Summer of 1924.**—*13th Ann. Rept. Med. Dept., United Fruit Co.*, pp. 207–209. Boston, Mass., 1924.

This is a list with short notes on some of the species of blood-sucking Diptera from the coast of Honduras and Costa Rica comprising:—

Culicidae.—*Anopheles albimanus, A. eiseni, Uranotaenia* sp. *Aëdes argenteus* (*aegypti*), *A. fluviatilis, A. taeniorhynchus, A. nubilus, A. euplocamus, A. trivittatus, Psorophora ferox, P. cilipes, Taeniorhynchus* (*Mansonia*) *titillans, Culex educator, C. leprincei, C. elevator,*

C. iolambdis, C. nigripalpus, C. fatigans (*quinquefasciatus*), *C. extricator, C. corniger, Limatus asullepta, Wyeomyia chalcocephala* and *W. onidus.*

Ceratopogoninae.—*Leptoconops* sp., *Culicoides phlebotomus* and *C. furens.*

Tabanidae.—*Chrysops costata, Diachlorus ferrugatus, Lepidoselaga crassipes* and *Tabanus fur.*

Hippoboscidae.—*Lynchia maura.*

Siphonaptera.—*Tunga penetrans, Echidnophaga gallinacea, Xenopsylla cheopis* and *Ctenocephalus felis.*

Ixodidae.—*Ixodes loricatus* var. *spinosus, Amblyomma cayennense* and *A. dissimile.*

Wagner (W.). **Bau und Funktion des Atmungssystem der Kriebelmückenlarven.** [Construction and Function of the Respiratory System in Simuliid Larvae.]—*Zool. Jahrb.*, Abt. f. Allg. Zool., xlii, no. 4, pp. 441–486, 17 figs., 3 pp. refs. Jena, 1926.

The contents of this paper are indicated by its title.

Berlese (A.). **La mosca domestica. Metodo di lotta pratico ed efficace.** [The House-fly. A practical and effective Control Measure.]—*Riv. Agric*, xxxi, no. 9, pp. 131–133. Rome, 26th February 1926.

Against house-flies [*Musca domestica*] a stock insecticide solution containing sugar beet molasses 100 parts, sodium or potassium arsenite 5 parts, and milk (even if skimmed or sour) 10 parts, is diluted for use with 5 or 10 parts by volume of water. The weaker solution is for spraying living foliage. All manure and dust heaps and plants growing near them and near dwellings should be sprayed at least every 6–8 days from May to October. In animal quarters bundles of ivy or ferns, treated with the strong solution, should be hung up near the light.

Shannon (R. C.) & Greene (C. T.). U.S. Bur. Ent. **A Bot-fly parasitic in Monkeys.**—*Zoopathologica*, i, no. 7, pp. 285–290, 2 pls., 2 figs. New York, 22nd January 1926.

Of the five genera of Cuterebrinae, which are apparently peculiar to America (*Dermatobia, Pseudogametes, Rogenhofera, Cuterebra* and *Bogeria*), *Dermatobia* parasitises man, monkeys, dogs, cattle and birds, but the others (except for *Rogenhofera*, the habits of which are unknown) seem to confine themselves to rodents and opossums; the flies may occasionally infest other hosts, such as cats, dogs and pigs, but these cases are accidental.

Cuterebra baeri, sp. n., has, however, been found heavily infesting the neck of howling monkeys (*Alouatta*) in Panama and British Guiana. Apparently the female fly oviposits near the haunts of the hosts, perhaps on the leaves of plants. The eggs are eaten with the leaves, and the larvae probably emerge in the mouth and begin to penetrate the tissues, working through the flesh until they reach the skin, through which a breathing and exit hole is made. There they stay, in a pocket just beneath the skin, until full-grown, when they fall to the ground for pupation.

SMIT (B.). **Sheep Blow-fly Control. Fly-traps : Their Construction and Operation.**— *Jl. Dept. Agric. Union S. Africa*, xii, no. 2, pp. 132–143, 4 figs., 5 refs. Pretoria, February 1926.

The efficiency of the trap previously described by Wahl and Du Plessis [*R.A.E.*, B, xii, 19–21] has been increased by the addition of gauze windows in the sides of the upper tin similar to that in the top. Further structural improvements made by the author include the use of a treacle-tin lid in place of paper stuck over the hole at which the trapped flies are emptied. The arrangement of an iron bar supporting a wooden wedge to keep the lid in place is described, as is also the entire construction of the trap. A comparison of four existing types of traps shows the present improved model to be far superior to the others. During one year 310,164 flies were caught by it, as compared with 105,898 for the Edwards trap [*loc. cit.*], and these were more than twice as numerous as in all the other traps together.

In South Africa any small animals such as rats, etc., can be used for the bait, but if it is intended for house-flies, it is best to mix the curd of sour milk with cheap brown sugar at the rate of ½ lb. sugar to 1 lb. of curd; the mixture is then wetted with water and can be made more lasting by the addition of bran.

Of the flies caught in the traps *Musca domestica*, L., was most abundant, followed by *Chrysomyia marginalis*, Wied. Others occurring in smaller numbers were *Calliphora vomitoria*, L. (*croceipalpis*, Jaenn.), *Sarcophaga haemorrhoidalis*, F., *Wohlfahrtia euvittata*, *Pyrellia splendida*, Adams, *Lucilia sericata*, Mg., and *Muscina stabulans*, Fall.

When setting the traps, it is advisable to place them on sheets of metal or pieces of corrugated iron, which should be at least three feet square, so as to keep grass and weeds from growing too near the trap. If properly looked after, the traps will last 3–4 years, the lower tin being easily renewed as required.

GURNEY (W. B.) & WOODHILL (A. R.). **Reports of the External Parasites in Sheep Committee of the Departmental Research Council. No. ii. Range and Longevity of Sheep Blow-flies.**— *Agric. Gaz. N.S.W.*, xxxvii, pt. 1, pp. 49–64, numerous figs. Sydney, 1st January 1926.

The importance of destroying carcases as a means of reducing blow-flies has been emphasised persistently, though the distance at which such carcases may prove a source of infestation has not hitherto been ascertained. Information on this point has, however, been gained by means of large scale liberations of marked flies, and their range of flight and longevity under normal conditions in Australia are better known. In all, 532,700 flies were liberated in the following order of abundance : *Chrysomyia albiceps*, *Anastellorhina augur*, *Pollenia* (*Neopollenia*) *stygia*, *C. varipes* and *Lucilia sericata*. Thirty-eight traps were used over an area of 314 sq. miles, and 574 of the stained flies were caught in them ; none of these was *C. varipes*. As the actual range of flight is at least ten miles, a single carcase is capable of infesting an area of 20 miles in diameter, or 314 sq. miles in area. *C. albiceps* can travel 10 miles within 12 days, other species 8 miles within 17 days, and all the species used in this experiment 4 miles within 12–16 days. It is probable that they will travel even greater distances since *C. albiceps* will travel 10 miles in 12 days and its adult

(K2938) Wt P 5/35 1,500 5/26 H & Sp Gp 52

life is at least 28 days. The majority of the flies travel with, or slightly across, the wind when searching for breeding or feeding grounds, but will follow the scent of carrion against a slight breeze.

The adult flies live from at least 8 to 28 days under field conditions, and probably longer. Under dry conditions in either hot or cold weather they travel further and more rapidly than under warm moist conditions with abundant water and grass.

Pumpelly (W. C.). **Case of Human Infestation by Larvae of the Fly** *Eristalis tenax*.—*Jl. Amer. Med. Assoc.*, lxxxiv, no. 1, p. 37. Chicago, Ill., 3rd January 1925.

A case of intestinal infestation of man by the larvae of *Eristalis tenax* is recorded.

Lanford (J. A.) & Warner (C. M.). **Human Myiasis due to Ox Bot Fly Larvae** (*Hypoderma lineatum*).—*New Orleans Med. & Surg. Jl.*, lxxvii, no. 11, pp. 473–474. New Orleans, May 1925.

A case is recorded of three larvae of *Hypoderma lineatum* infesting a child.

Hirst (S.). **On the Nymphal Form of the Harvest Bug** (*Trombicula* (*Neotrombicula*) *autumnalis* **Shaw**).—*Ann. App. Biol.*, xiii, no. 1, pp. 140–143, 2 figs. Cambridge, February 1926.

The nymphal form of *Trombicula* (*Neotrombicula*) *autumnalis*, Shaw, is briefly described from a single specimen bred from a large number of larvae infesting fowls [*cf. R.A.E.*, B, xiii, 178].

Bayon (H. P.). **Virus Diseases of Bacteria, Plants and Vertebrates.**—*Jl. Trop. Med. & Hyg.*, xxix, no. 2, pp. 17–37. London, 15th January 1926.

In view of the suggestion that cancer may be due to an ultramicroscopical virus resulting from helminthic infestation, the present knowledge on the filtrable viruses is reviewed. In the course of this work diseases conveyed by Arthropods to plants and vertebrates, particularly the latter, are briefly discussed.

Pinto (C.). **Sobre um Reduvideo transmissor do** *Trypanosoma cruzi*. [On a Reduviid Carrier of *T. cruzi*.]—*Sciencia medica*, ii, no. 8, pp. 426–427, 1 fig. Rio de Janeiro, 31st August 1924.

A brief account is given of *Rhodnius pictipes*, Stål, its occurrence in Brazil, and its natural infection with and experimental transmission of *Trypanosoma cruzi*. In the laboratory the life-cycle occupied just over a year. An egg laid on 30th April 1923 hatched on 14th May, the adult emerging on 10th May 1924.

Hoffmann (W. H.). **Observaciones sobre el desarollo de las Reduviidas.** [Observations on the Development of Reduviids.]—*Rev. chil. Hist. nat.*, xxix, pp. 185–188, 1 fig. Santiago, 1925.

In Cuba *Triatoma flavida* is so rare that only about a dozen specimens are known. The author has been breeding this species during the

past 4 years. The first female received had probably been fertilised prior to capture, for in 10 weeks she laid 370 eggs, all fertile, and nearly 600 more up to the time of her death, though these failed to hatch. The eggs hatched in 20 days, and the larvae sucked blood when 1 or 2 days old. In 5 individuals the period from hatching to the emergence of the adult occupied nearly 25 months on an average, and seven larvae of the same brood were, at the time of writing, 33 months old and not half the size of an adult. The maximum life observed has been 3 years for larvae and 1 year for adults.

CHRISTOPHERS (S. R.), SHORTT (H. E.) & BARRAUD (P. J.). **Our present Knowledge regarding the Transmission of Kala Azar in Nature.**—*Proc. Assam Branch, Brit. Med. Assoc., Ann. Meeting, Jorhat, 2nd March 1925*, pp. 22–27.

This is a review of the results of recent experiments on the relation to kala-azar of *Phlebotomus* and other insects [*R.A.E.*, B, xiii, 30, 79 ; xiv, 11].

STRICKLAND (C.). **The Mosquito Factor in the Malaria of Assam and its Prevention.**—*Proc. Assam Branch, Brit. Med. Assoc., Ann. Meeting, Jorhat, 2nd March 1925*, pp. 30–42.

This paper has already been noticed from another source [*R.A.E.*, B, xiv, 12].

SINTON (J. A.). **Notes on some Indian Species of the Genus** *Phlebotomus*. **Part xiv. The Hypopygium of the Female** *Phlebotomus*.—*Ind. Jl. Med. Res.*, xiii, no. 1, pp. 97–108, 2 pls., 12 refs. Calcutta, July 1925. [Recd. March 1926.]

A critical examination of the hypopygium of the females of various species of *Phlebotomus* has failed to reveal any features of the same primary diagnostic importance as found in the male. The most important characters appear to be the shape of the furca and the number and arrangement of bristles and hairs on the postgenital ridge.

MICHAEL (D. F.). **Note on the Incidence of Kala-azar on the Pusa Estate.**—*Ind. Jl. Med. Res.*, xiii, no. 1, pp. 131–139, 1 map. Calcutta, July 1925. [Recd. March 1926.]

Notes are given on the 69 cases of kala-azar recorded from the Pusa estate up to July 1924, the first case being noticed in 1913. The disease appears to be essentially a house infection associated with unhygienic modes of living, small children being particularly susceptible. It is possible that an insect vector is not primarily responsible for the spread of the disease, though its transmission by mechanical means does not necessarily exclude the possibility of a blood-sucking insect harbouring the parasite. The incidence of the disease appears to be highest from December to February. In most houses where infections occurred bed-bugs [*Cimex*] were always present, and in many cases mosquitos and sandflies [*Phlebotomus*] were noticed, particularly during the monsoons.

Shortt (H. E.). **Note on** *Bodo phlebotomi* (*Herpetomonas phlebotomi*) **(Mackie 1914) : A Reconsideration of its Generic Position.**—*Ind. Jl. Med. Res.*, xiii, no. 1, pp. 141–142, 1 pl., 1 ref. Calcutta, July 1925. [Recd. March 1926.]

It is suggested that the parasite of *Phlebotomus minutus* described from Assam in 1914 as *Herpetomonas phlebotomi* [*R.A.E.*, B, ii, 184] should be transferred to the genus *Bodo*.

Shortt (H. E.) & Swaminath (C. S.). **Experiments to decide whether the Bed-bug** *Cimex hemiptera*, **Fabr., can transmit Indian Kala-azar.**—*Ind. Jl. Med. Res.*, xiii, no. 1, pp. 143–147, 2 refs. Calcutta, July 1925. [Recd. March 1926.]

In experiments *Cimex hemiptera*, F., failed to transmit kala-azar to the monkey, *Macacus rhesus*, by its bite, either directly from the mouth-parts themselves or indirectly through contamination of the bite punctures by its faeces. A monkey fed on the faeces of bed-bugs fed on cases of kala-azar remained in perfect health, and both microscopical and cultural examination of its organs gave negative results.

Cultures of the gut of 138 individuals of *C. hemiptera*, caught in the bedding of kala-azar patients, were all uniformly negative.

Goré (S. N.). **Calcium Cyanide Fumigation.**—*Ind. Jl. Med. Res.*, xiii, no. 2, pp. 287–299, 2 figs. Calcutta, October 1925. [Recd. March 1926.]

For generating hydrocyanic acid gas for fumigation purposes calcium cyanide is quite as effective as, and much more convenient than, sulphuric acid and potassium or sodium cyanide. To be effective in killing rodents and insects the concentration of hydrocyanic acid gas must not be less than 30–50 parts to 100,000 of air, and the exposure must not be less than ½–1 hour. In a number of experiments it was found that to obtain these conditions in an airtight or almost airtight chamber, the amount of calcium cyanide required for a lethal dose is 1 oz. per 100 cu. ft. of space, although three times this amount is not lethal in places that are not airtight. When calcium cyanide is used at this rate, a lethal concentration is obtained after it has been exposed to the air for about 1½ hours, and is maintained for about 4 hours.

Several experiments were made to test the diffusion of hydrocyanic acid gas in narrow channels constructed to resemble rat burrows; these channels were covered with plate glass so that the effect of the gas on the rats placed in them could be observed. It was found that hydrocyanic acid gas did not diffuse along the channels at all satisfactorily; while the concentration was high (300 parts per 100,000 of air) where the calcium cyanide was introduced, it was very low (5–10 parts per 100,000) only a foot away from it. A caged rat at little more than this distance from the calcium cyanide survived an exposure of 19 hours. By pumping air into the channel it was found possible to diffuse the gas so that it became partially effective.

Christophers (S. R.). **Two Malarial Surveys connected with Industrial Projects in certain very highly Malarious Localities in India.**—*Ind. Jl. Med. Res.*, xiii, no. 2, pp. 343–406, 1 pl., 8 maps, 2 charts. Calcutta, October 1925. [Recd. March 1926.]

These two reports on malarial surveys are reprints of Government publications. The first is on a survey of a sugar estate in Assam, and incorporates much of the work of Dr. B. S. Chalam [whose final report [*R.A.E.*, B, xi, 217], was written after Lieut.-Colonel Christophers had visited the estate, and after certain recommendations made in the report here reprinted had been followed]. The second has already been noticed [*R.A.E.*, B, xii, 111].

Shortt (H. E.), Barraud (P. J.) & Craighead (A. C.). **Note on a Massive Infection of the Pharynx of** *Phlebotomus argentipes* **with** *Herpetomonas donovani*.—*Ind. Jl. Med. Res.*, xiii, no. 3, pp. 441–443, 2 figs., 1 ref. Calcutta, January 1926.

Further observations have been made on the feeding of *Phlebotomus argentipes*, Annan. & Brunetti, on cases of Indian kala-azar [*R.A.E.*, B, xiv, 11]. Flies that had been fed twice on cases of kala-azar were examined on the 8th day after the original feed, and flagellates of *Leishmania* (*Herpetomonas*) *donovani* were found not only in the anterior part of the pharynx but also in the middle and posterior portion. Sections of the head were obtained showing a massive infection with flagellates at the posterior end of the pharynx; a diagram shows the exact location. Sections were later obtained of an 8th day fly (fed twice on kala-azar cases) and of a 7th day fly (fed first on a kala-azar case and then on a mouse) both of which show, in addition to a very heavy infection of the midgut and pharynx, a definite infection of the buccal cavity. Of 14 consecutive 5th day flies cut entire, 10 showed infection of the midgut, 6 an infection of the midgut and pharnyx combined, and 4 were entirely negative.

Sinton (J. A.). **Notes on some Indian Species of the Genus** *Phlebotomus*. **Part xv.** *Phlebotomus newsteadi* **n. sp.**—*Ind. Jl. Med. Res.*, xiii, no. 3, pp. 559–564, 1 pl., 2 refs. Calcutta, January 1926.

A description is given of of the male of *Phlebotomus newsteadi*, sp. n., taken in buildings in the Punjab.

Iyengar (M. O. T.). **The Anopheline Fauna of a Swamp in Bangalore.**—*Ind. Jl. Med. Res.*, xiii, no. 3, pp. 697–702, 3 pls., 1 fig. Calcutta, January 1926.

The topography of a small, swampy area near Bangalore City, Mysore, is described with reference to its Anopheline fauna. The species found show a tendency to form distinct ecological groups with definite preferences for different breeding-places. *Anopheles karwari*, James, and *A. maculipalpis*, Giles, bred only in the seepages present; *A. jeyporensis*, James, and *A. listoni*, List., only occurred in streams with *A. culicifacies*, Giles, while *A. pallidus*, Theo. (*fowleri*, Christ.), *A. hyrcanus*, Pall., and *A. jamesi*, Theo., were found only in stagnant waters. In isolated pools and ditches *A. fuliginosus*, Giles, and *A. barbirostris*, Wulp, were observed. The factors restricting various species to particular types of breeding-place are probably

the nature of the aquatic vegetation and also the dissolved constituents of the water. In many of the pools in this area an undetermined species of *Chara* is growing, without, apparently, any harmful effect on mosquito larvae, which thrive very well just over the sub-aquatic bushes of *Chara*, while females seem to prefer this situation for oviposition. The seepages and streams were the only breeding-places of any importance, many of the species found there being noted malaria carriers. The most practicable way of dealing with the situation in this particular locality would seem to be the construction of small subsoil drains that would take away the continuous flow of water without exposing it for mosquito breeding, and if these were made to start within the seepage area, much of the seepage would be prevented. As the area to be treated is small, the measure would be both efficient and economical.

Turkhud (D. A.), Krishnan (K. V.) & Seetharama Iyer (P. V.). **An Investigation of Kala-azar in certain Endemic Areas in Southern India.**—*Ind. Jl. Med. Res.*, xiii, no. 3, pp. 703–747, 1 map. Calcutta, January 1926.

As the result of a survey of many localities of Southern India, where kala-azar is endemic, the epidemiological aspects of the disease in those districts, the habits and customs of the people, the entomological work done, with observations on the biting insects in the areas visited, and the inferences to be drawn are discussed. The two probable methods of transmission of the disease are oral ingestion of infected material and transmission through a blood-sucking insect. The first possibility, which is discussed at some length, has many points in its favour, and it is pointed out that if kala-azar is transmitted by biting insects, children and adults should be equally liable to the disease, while examination has proved that the former are the more affected. The presence of cases of spontaneous cures and of symptomless kala-azar suggest that adults may possibly have acquired some immunity from the disease. As in the case of other investigators, only negative results have been obtained from the dissection of bugs, *Cimex hemiptera* (*rotundatus*) caught in houses or fed on persons harbouring the disease, and dissection of lice (*Pediculus*), *Phlebotomus*, *Culicoides*, fleas and cockroaches taken from infected houses was also without result. The occurrence of *Phlebotomus*, however, and the conditions appertaining to this midge, are in many ways in favour of the possibility of its being a vector. The conditions existing in Mahommedan houses in the endemic areas investigated would favour it, and, if *P. argentipes* were concerned in the transmission, would explain why this portion of the community was more especially affected.

Sergent (Edm.) & Parrot (L.). *Phlebotomus papatasii* **and Oriental Sore.**—*Ind. Jl. Med. Res.*, xiii, no. 3, pp. 749–750. Calcutta, January 1926.

In a note referring to J. A. Sinton's discussion of their work with regard to the theory that some species of *Phlebotomus* may be the carrier of oriental sore [*R.A.E.*, B, xiii, 121], the authors explain their method of identification of *P. papatasii* in this connection and consider it proved that, in their experiments, *P. papatasii* was the only species

involved. They do not suggest, however, that this species is the only vector, nor deny that in some other places *P. sergenti* may also carry the disease.

[Popov (P. P.).] Попов (П. П.). **An Attempt to Study *Phlebotomus* in Turkestan.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 1, pp. 15–20, 18 refs. Moscow, 1926. (With a Summary in English, p. 28.)

Phlebotomus papatasii, Scop., *P. caucasicus*, Marz., *P. perniciosus*, Newst., *P. li*, Popov, and *P. minutus*, Rond., are recorded from Turkestan, and a key to them is given. Both oriental sore and kala-azar occur in Turkestan.

Bibliographical Index to Malaria in the Russian Language. [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 1, pp. 29–64. Moscow, 1926.

This is the first part of an index to Russian literature on malaria up to 1913, and is arranged under the authors' names.

Descazeaux (J.). **Spirochétose cutanée du Porc.**—*Bull. Soc. Path. exot.*, xix, no. 2, pp, 86–88. Paris, 1926.

A disease in pigs of spirochaetal origin is described from Chile. It could not be transmittted experimentally to laboratory animals and was not transmitted to healthy pigs though these were confined with diseased animals for several months.

Numbers of *Hematopinus suis* were found on the infected animals, but these lice have not been found to harbour any spirochaete.

[Rukhadze (N. P.).] Roukhadzé (N.). **Un example de l'influence de la stabulation des animaux sur la diminution du paludisme en Géorgie.**—*Bull. Soc. Path. exot.*, xix, no. 2, pp. 100–105, 2 refs. Paris, 1926.

In a survey of three villages in Georgia with a view to ascertaining the effect of domestic animals on the incidence of malaria, the disease was least prevalent where the animals remained near at hand throughout the summer and were stabled at night.

The mosquito larvae present in winter were those of *Culex* and *Anopheles bifurcatus*; adults were not numerous.

Blacklock (D. B.). **Notes on a Mosquito Survey at Daru, Sierra Leone.**—*Sierra Leone: Ann. Med. & Sanit. Rept. 1924*, pp. 61–68, 1 chart. Freetown, 1925. [Recd. March 1926.]

A detailed report is given of a survey carried out at Daru, Sierra Leone, during the 17th–28th September 1924. The mosquitos found included *Anopheles gambiae*, Giles (*costalis*, Lw.), *A. mauritianus*, Grp., *A. umbrosus*, Theo., and *A. nili*, Theo., and the following Culicines not previously recorded from Sierra Leone, *Aëdes* (*Finlaya*) *longipalpis*,

Grünb., *A.* (*Aëdimorphus*) *domesticus*, Theo., *Megarhinus* (*Toxorhynchites*) *brevipalpis*, Theo., *Culex decens* var. *invidiosus*, Theo., *C. annulioris*, Theo., *Lutzia tigripes* var. *fusca*, Theo., *Uranotaenia bicolor*, Leic. (*fusca*, Theo.), and *Mimomyia hispida*, Theo. The breeding-places investigated are described, and the remedial measures to reduce and eradicate them are outlined. They were chiefly directed against *Anopheles gambiae* in the swamps and other Anopheline breeding-places in the river. A survey of trees and shrubs showed that Culicines breed in them but not Anophelines. *A. gambiae* was frequently found in houses, and although *A. nili* was breeding freely in a river, only one individual was found in a house nearby. *Aëdes argenteus*, Poir., was found only in one breeding-place, and its absence from tree and plant breeding-places is remarkable, though the Megarhine larvae usually found alone in small collections of water in trees and plants may account for its scarcity.

Hall (G. R.). **Malaria in West Africa in 1893.**—*Jl. Trop. Med. & Hyg.*, xxix, no. 5, pp. 70–76. London, 1st March 1926.

A description is given of the ideas concerning malaria in West Africa in 1893 before the exact connection between mosquitos and the disease had been established. The social effects that malaria had on the population in those days and the old methods of treating it are discussed. Present day conditions are briefly compared.

van Someren (V. G. L.) & de Boer (H. S.). **Report on the Mosquito Breeding Areas within the Nairobi Municipal Area, with special reference to Waters containing Anopheline Larvae.**—*Kenya Med. Jl.*, ii, no. 10, pp. 277–298, 1 map, 16 pls. Nairobi, January 1926.

A detailed survey of the breeding-places of Anophelines in the Nairobi area is described. Malaria carriers, with the possible exception of *Anopheles gambiae*, Giles (*costalis*, Lw.), are all somewhat scarce within the township, and even the numbers of this species are not uniform throughout the year. The areas surveyed are described in detail, and tables are given showing the species of Anophelines observed and the areas in which they were obtained.

Notes on the breeding-places show larvae to have occurred as follows :—*A. gambiae* in quiet backwaters of streams and in standing water open to strong sunlight ; *A. cinereus*, Theo., in reedy swamps, borrow pits, seepage water, quarries and large receptacles open to sunlight, the adults entering buildings readily after dark and hiding in dark corners during daylight ; *A. mauritianus*, Grp., in fresh, clear waters in swamps, pools, backwaters of running streams, rocky pools and river beds, preferring alternate shade and sunlight with comparative coolness ; *A. christyi*, N. & C., found in similar situations to *A. cinereus* and sometimes in foul, stagnant water, the adults commonly entering buildings ; *A. pretoriensis*, Giles, in seepage water from murram and rock strata, pools of clear water with algal growth, and clear pools along irrigation trenches ; *A. maculipalpis*, Giles, found in similar situations ; *A. squamosus*, Theo., most frequently along the edges of swamps where there is sufficiency of free water in which short vegetation is present, the larvae attaching themselves to the edges of the lower surface of the floating vegetation when the water is disturbed, and in pools exposed

to sunlight ; *A. transvaalensis*, Cart., and *A. funestus*, Giles, both found in dark and shaded situations and hanging on the lower surface of floating débris. *A. marshalli*, Theo., and *A. rhodesiensis*, Theo., were also found breeding, and all the above species, with the exception of *A. maculipalpis* and *A. rhodesiensis*, were captured in dwellings or outhouses in one small area, 60 per cent. of the captures being females. Forty-two species of Culicids of other genera are also recorded.

Cleare, jr. (L. D.). **Report of the Biological Division.**—*British Guiana ; Rept. Dept. Sci. & Agric. 1924*, pp. 65–68. Georgetown, Demerara, 1926.

Aëdes taeniorhynchus, Wied., is described as breeding in the vicinity of Georgetown, and *Anopheles tarsimaculatus*, Goeldi, also breeds at certain times in the salt-water pools in this area.

Faust (E. C.). **A Preliminary Check List of the Mosquitoes of the Sino-Japanese Areas.**—*China Med. Jl.*, xl, no. 2, pp. 142–143. Shanghai, February 1926.

The majority of the 28 Anophelines and 38 Culicine mosquitos in this list from the Sino-Japanese areas are Oriental forms, with a number of Palaearctic, one Nearctic and one Australian form. The information is fairly complete for South China, Formosa and Indo-China, but not for Assam, Japan and the rest of China.

Anopheles hyrcanus, Pall. (*Myzorhynchus sinensis*, Wied.) is the only malarial mosquito common to the area. From statistical evidence this mosquito or *A. maculipennis*, Mg., appears to be the malarial carrier in the North, while *A. subpictus*, Grassi (*Myzomyia rossi*, Giles) and *A.* (*Nyssorhynchus*) *maculatus*, Theo., appear to share the responsibility with *A. hyrcanus* in South China and the adjacent territory. Of the Culicines, *Culex fatigans*, Wied., *C. vishnui*, Theo., and *Aëdes* (*Stegomyia*) *albopictus*, Skuse, are widely distributed, while the yellow fever mosquito, *A. argenteus*, Poir. (*fasciatus*, F.) has been recorded only from Formosa and possibly from Japan.

Other mosquitos conveying disease are : *Anopheles hatorii*, Koidzumi, *A. minimus*, Theo., *A. fuliginosus*, Giles, *A. willmori*, James, *A. aconitus*, Dön. (*albirostris*, Theo.), *A. superpictus*, Grassi, *A. tessellatus*, Theo., *A. stephensi*, List., and *A. punctulatus*, Dön., all vectors of malaria ; *Aëdes argenteus* and *Culex fatigans*, vectors of filariasis ; and *A. variegatus*, Dol. (*scutellaris*, Wlk.), *Armigeres obturbans*, Wlk., and *Culex fatigans*, vectors of dengue.

[Vasil'ev (I. V.).] **Васильев (И. В.). On the Insect Fauna of Cellars and other Places where Mosquitos hibernate.** [*In Russian.*] —*Profilaktich. Med.*, no. 10–11, reprint, 2 pp. Kharkov, 1925. [Recd. April 1926.]

In a survey of cellars and similar places, where hibernating mosquitos are likely to be found, in some villages in the Ukraine, *Culex pipiens*, L., occurred everywhere in large numbers, amounting in some places to 81·6 per cent. of the total number of Diptera caught, as against 15·3 per cent. of *Anopheles maculipennis*, L. The percentage of Anophelines in all the collections made varied from 1·5 to 28·4 per cent. The other Diptera caught were mainly Tipulids and Muscids.

VAN THIEL (P. H.). **Maxillenzahnzahl und Flügellänge bei** *Anopheles maculipennis*. [The Number of Maxillary Teeth and the Wing Length in *A. maculipennis*.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxx, Beiheft 1, pp. 67–75, 11 refs. Leipzig, 1926. (With a Summary in English.)

Examination of females of *Anopheles maculipennis*, Mg., from Leyden, Bolsward and Amsterdam has shown the existence of local races differing in morphological characters, especially in the length of wing, and, to a less degree, in the number of maxillary teeth. At Leyden, the mosquitos had a longer wing and fewer teeth than at Bolsward, thus reversing Martini's theory that the smaller number of teeth was simply a consequence of the smaller length of the mosquito.

KOPSTEIN (F.). **The Moluccas.**—*Meded. Dienst Volksgezondheid Ned.-Indië*, Foreign Edn., 1926, no. 1, pp. 1–78, 7 figs., 14 pls., 2 maps. Batavia, 1926.

This report covers the various islands forming the Moluccas group, which, with Dutch New Guinea constitute the Residency of Ambon. The islands of Aru, Sula and Halmaheira do not belong faunistically to the Moluccas, to which they are attached politically.

The Anophelines found in Amboina are : *Anopheles* (*Myzorhynchus*) *barbirostris*, Wulp ; *A. barbirostris* var. *pallidus*, Sw. ; *A.* (*Stethomyia*) *aitkeni* var. *insulaeflorum*, Sw., *A.* (*Myzomyia*) *subpictus*, Grassi (*rossi*, Giles) ; *A.* (*M.*) *vagus*, Dön. ; *A.* (*Neomyzomyia*) *punctulatus*, Dön. ; and *A.* (*Nyssorhynchus*) *punctulatus* (*annulipes*) var. *moluccensis*, Sw. *A.* (*M.*) *ludlowi*, Theo., occurs both in Amboina and Ceram. The principal Culicines in Amboina are *Culex fatigans*, Wied., and *Aëdes argenteus*, Poir. (*Stegomyia fasciata*, F.). In Saparua and Nusalaut *A. punctulatus* var. *moluccensis* and *A. barbirostris* were the only species observed. These, together with *A. aitkeni* var. *insulaeflorum* and *A. subpictus*, occurred in Haruku. In Saparua Anophelines are seldom found, and the island is considered free from malaria.

RODENWALDT (E.). **Entomological Annotations III.**—*Meded. Dienst Volksgezondheid Ned.-Indië*, Foreign Edn., 1926, no. 1, pp. 79–98, 1 table, 3 pls. Batavia, 1926.

This is an English version of a paper on the distribution of Anophelines in the Indian Archipelago already noticed from another source [*R.A.E.*, B, xiii, 111].

ALESSANDRINI (G.) & MISSIROLI (A.). **Sulla struttura dell'apparato respiratorio della** *Anopheles*. [On the Structure of the breathing Apparatus of *Anopheles*.]—*Riv. Malariologia*, v (N.S. i), no. 1, pp. 35–43, 10 figs. Rome, January–February 1926. (With Summaries in French and English, pp. 108 & 111.)

In Anophelines there is in the post-stigmatic chamber a chitinous structure that acts as a valve, but as it is not air-tight, these mosquitos are not protected against the action of poisonous gases. The structure is fully described and figured.

La Face (L.). **Revisione degli Anofelini italiani. Nota I.** [Revision of the Italian Anophelines. I.]—*Riv. Malariologia*, v (N.S. i), no. 1, pp. 44–48, 2 pls. Rome, January–February 1926. (With Summaries in French and English, pp. 109 & 111.)

The author agrees with Grassi in not treating *Anopheles elutus*, Edw., as distinct from *A. maculipennis*, Mg. (*claviger*, auct.). Neither the absence of egg-floats nor the different number of hairs in the basal lobes of the male hypopygium is considered a character of specific value. Falleroni has suggested that there are possibly two varieties of *A. maculipennis* [*R.A.E.*, A, xiii, 81 ; xiv, 16], the two types of eggs discovered by him being associated with differences in the adults. The author believes these differences to be seasonal variations, but this requires further investigation.

Cuboni (E.). **Osservazioni sulla biologia dell'** *Anopheles superpictus* **e dell'** *Anopheles algeriensis* **e caratteri differenziali delle loro larve.** [Observations on the Biology of *A. superpictus* and *A. algeriensis* and the Specific Characters of their Larvae.]—*Riv. Malariologia*, v (N.S. i), no. 1, pp. 49–53, 1 pl. Rome, January–February, 1926. (With Summaries in French and English, pp. 109 & 111.)

The characters that differentiate the larvae of *Anopheles superpictus*, Grassi, from those of *A. algeriensis*, Theo., are described. At Bianconovo, Italy, the larvae of *A. superpictus* were chiefly found in the clear water of mountain streams with or without vegetation. They can live in shady or sunny places, but prefer the latter, and occur in those parts of the streams where the flow is gentle. Their occurrence in stagnant water is exceptional. Though the adults have domestic habits, they oviposit far from dwellings. This species reaches its maximum abundance in August-September. It hibernates in the adult stage, principally in animal quarters. It can fly to greater distances than *A. maculipennis*, Mg. (*claviger*, auct.).

Hitherto *A. algeriensis* has been confused at Bianconovo with *A. bifurcatus*, L. The larva is described, for the first time, the characters differentiating it from that of *A. bifurcatus* being given. The larvae occur in shaded situations in small streams with a gentle flow and abundant vegetation. The adults are very rare in animal quarters and dwellings, and their importance as vectors of malaria in this region is almost negligible.

Paterson (N. F.). **The Effects of Changes of Hydrogen-ion Concentrations on Culicine Mosquito Larvae.**—*S. Afr. Jl. Sci.*, xxii, pp. 311–317. Johannesburg, November 1925. [Recd. March 1926.]

In these experiments *Culex fatigans*, Wied., and *Theobaldia longiareolata*, Macq., were collected from a water-butt in which the aquatic plant, *Lagarosiphon*, was growing. The hydrogen-ion concentration was determined as 7·8. Various solutions of calcium superphosphate, lime, common salt and copper sulphate were made, from which a range of pH values was obtained. Any variation in the pH concentration had some marked effect on the larvae, often resulting in early death or inhibition of development. Calcium superphosphates and lime are apparently potent larvicides and may be used without

injury to water for domestic or irrigation purposes. In the superphosphates in concentrations of 17 in 2,000 and 17 in 10,000, having respectively pH values of 3·0 and 3·4, all the larvae succumbed within 72 hours. Even in relatively weak solutions (17 in 1,000,000) with a pH of 7·2 some of the larvae died after 41 hours, and all were dead after 7 days. Phosphoric acid is apparently decidedly toxic to mosquito larvae, even more so than copper sulphate, and in very few instances did the larvae live long enough in the solutions to develop into adults.

In the case of lime the larvae were more affected in weak solutions of medium alkalinity than in stronger, markedly alkaline, ones. In concentrations of 17 in 10,000,000 (pH 8·4), the larvae became distressed and died in 4 days, while in concentrations of 17 in 1,000,000 (pH 8·6) half the larvae died in 2 days, and the rest after 11 days. In solutions of 17 in 100,000 with a pH value of 10·0, the larvae were not greatly affected. It is probable that Culicine larvae, as they have been found to inhabit water of an alkaline reaction, are more tolerant of alkaline media than of those giving a decidedly acid reaction. Any chemical therefore that produces an acid or faintly alkaline reaction will probably prove to be a more powerful larvicide than one with markedly alkaline reaction, especially if the latter gives approximately the same reaction as the water that the larvae naturally inhabit.

Copper sulphate and common salt are good larvicides, but are only efficacious in rather concentrated solutions, which would be very dangerous in the case of the former.

Mitra (P. N.). **One Season of Anti-Malarial Work at Pasighat.**—*Indian Med. Gaz.*, lxi, no. 3, pp. 112–113, 3 charts. Calcutta, March 1926.

In a river station in Assam, around which the jungle had been cleared, a mosquito survey in 1918 showed *Anopheles maculatus* to be the most abundant Anopheline, others recorded being *A. hyrcanus* (*sinensis*), *A. fuliginosus*, *A. barbirostris*, *A. aitkeni*, *A. neoaitkeni*, *A. listoni*, and *A. culiciformis*.

An outbreak of malaria occurred in 1916, and became worse in 1917. The clearing of the jungle and oiling the stream was then recommended. The work was done by untrained men, without locating the breeding grounds of the mosquitos. A survey of mosquitos in 1925 showed that, with the exception of a few individuals of *A. listoni*, *A. maculatus* was the only species present, having probably been favoured by the clearing work. If further deforestation on the banks of the stream were stopped, and the part of the stream already exposed were allowed to revert to jungle, conditions might become unsuitable for the breeding of *A. maculatus*. As this species was found breeding in November, oiling should be continued until the end of that month at least.

Chalam (B. S.) & Dalal (P. A.). **Bombay Millponds and Anopheline Control.**—*Indian Med. Gaz.*, lxi, no. 3, pp. 115–116. Calcutta, March 1926.

The northern half of the island on which Bombay stands is studded with a large number of millponds that are no longer in use and form a potential breeding-place for mosquitos throughout the year. Fortunately, the predominating species in the city is *Anopheles subpictus*,

which is not a carrier of malaria. As the usual larvicidal methods were impracticable, Paris green, mixed with about 20 times its weight of fine cork dust, was dusted over the ponds, and two days after treatment no larvae could be found in repeated dippings. The time necessary for repopulation of these ponds with Anopheline larvae has not yet been determined.

PURDY (W. C.). **Biological Investigation of California Rice Fields and Attendant Waters with reference to Mosquito Breeding.** – *U.S. Pub. Health Serv.*, Pub. Health Bull. 145 (December 1924), 61 pp., 30 figs. Washington, D.C., 1925. [Recd. March 1926.]

Investigations in Californian ricefields [*R.A.E.*, B, ix, 32] were continued during 1920 and extended in scope in order to confirm or disprove the negative results obtained in 1919 from one ricefield, and to determine the probable reason for the apparent lack of mosquito breeding in that field. The field, which in 1919 showed practically no breeding of mosquitos, showed essentially identical conditions in 1920, though breeding occurred in three other ricefields, 2, 20 and 75 miles distant respectively. The method of irrigation and consequent water deposits, which eventually become stable, lasting from one watering to the next, are described. As the puddles become more stable, algal growths start on a small scale and further flooding of the fields results in scattering much of these algae over various parts of the field.

Mosquito breeding, as it occurs in the majority of ricefields of the district, is described, as well as the results of alkalinity determination of the waters and a study of the growths of algae, with other conditions influencing breeding. A careful comparison of the field under discussion, which showed no breeding, exhibited no considerable or essential difference from other fields of the vicinity in the number of larval enemies, relative amount of food supply, temperature, alkalinity of water, free carbon dioxide, dissolved oxygen or relative stability. Study of the algal growths, however, did reveal a difference which appears to be fundamental and well marked. This field contains a very heavy growth of a blue-green alga (*Tolypothrix*), which was not found, except in rare instances and in minute quantities, in any other of the fields or waters examined. Moreover, the water in the feed canal, before coming into contact with this alga, was found to be favourable for larval development. It therefore seems probable, though further research on the point is necessary, that the lack of mosquito breeding in this particular field may be related to the heavy growth of *Tolypothrix* in it.

HOWARD (L. O.). **Mosquito Work during the year 1924.**—*Proc. 12th Ann. Meeting New Jersey Mosquito Exterm. Assoc., Atlantic City, 1925*, pp. 6–16. New Brunswick, N.J., 1925. [Recd. March 1926.]

This useful summary of work on mosquitos and mosquito control during 1924 is on the lines of previous ones [*R.A.E.*, B, xii, 76 ; xiii 24]. Almost all the various papers discussed have been noticed from time to time in this *Review*. In discussing Legendre's experiment in introducing a non-anthropophilous race of *Culex pipiens*, L., from the

sea-coast of Brittany to the neighbourhood of Paris [*R.A.E.*, B, xiii, 26], the author advances the theory that the sea-coast race interbred with the inland race and that their progeny inherited the preference of the former for the blood of animals ; he also considers that it is unlikely that this character will be retained in the new environment indefinitely.

In the United States, control of forest mosquitos, *Aëdes* spp., which mostly have only one generation a year and breed in pools formed by melted snow, has presented considerable difficulty on account of the temporary nature of the breeding-places and their inaccessibility. In several of the national parks, where these mosquitos are abundant, much money has been wasted in oiling streams and ponds during the summer. Recently, however, oiling has been carried out intelligently in the early spring, with good results [*cf. R.A.E.*, B, xi, 139].

Experiments in Louisiana by W. V. King in dusting rice fields, wooded swamps, and lakes, from aeroplanes, with Paris green diluted with Tripoli earth, road-dust, or flour and lime, for the control of mosquito larvae, have given very satisfactory results. It was found that a given area could be covered with dust thoroughly, provided that the velocity of the wind did not reach 10 miles an hour. The best results were obtained in rice fields, and in lakes or swamps covered with aquatic vegetation, but without trees or brush. In one experiment all the mosquito larvae in a number of pans scattered over the lake dusted were killed, and only a very few small larvae were found in one place in the lake itself.

RUDOLFS (W.). **The Food of Mosquito Larvae.**—*Proc. 12th Ann. Meeting New Jersey Mosquito Exterm. Assoc., Atlantic City, 1925*, pp. 25–33, 3 refs. New Brunswick, N.J., 1925. [Recd. March 1926.]

In view of the importance of a fuller knowledge of the breeding habits of mosquitos and their relation to the kind of food present and the composition of the water about fifty collections of water and mosquito larvae were made from various types of breeding-places. The water was in each instance analysed and microscopically examined for plant and animal life, and the gut contents of the mosquito larvae were examined. The results obtained in five cases are tabulated and discussed in some detail. Examination of the gut contents of both young and older larvae indicated that the Protozoa, *Euglena* spp., form an important part of their food. It appears, however, that the food is taken at random ; if undisturbed, the larvae move their mouthparts continually, creating a current in the water, only stopping if a large particle is seized and then only long enough for it to be crushed and swallowed or cast aside. By determining the food of various mosquitos, it will perhaps be possible to kill the larvae by destroying their food supply with very dilute chemicals.

In the discussion that followed it was stated incidentally that one of the difficulties experienced in dusting lakes and swamps with Paris green and Tripoli powder [see preceding paper] was that these substances do not float on the surface of the water for more than a few hours ; work has been begun to find a diluent for Paris green that will so increase the surface tension that both substances will float indefinitely.

Lipman (J. G.). **The Mosquito in its Relation to Agricultural Progress.** —*Proc. 12th Ann. Meeting New Jersey Mosquito Exterm. Assoc., Atlantic City, 1925*, pp. 21–24. New Brunswick, N.J., 1925. [Recd. March 1926.]

The author considers that the spread of malaria by mosquitos among agricultural populations and the diminution of the food supply consequent upon the lessened vitality of the inhabitants was the ultimate cause of the decay of many ancient civilisations. In southern New Jersey the agricultural development of huge areas of land is at present hindered or prevented by the abundance of the salt-marsh mosquito [*Aëdes sollicitans*, Wlk.].

Viosca, jr. (P.). **A Bionomical Study of the Mosquitoes of New Orleans and South-eastern Louisiana.**—*Proc. 12th Ann. Meeting New Jersey Mosquito Exterm. Assoc., Atlantic City, 1925*, pp. 34–50, 4 figs. New Brunswick, N.J., 1925. [Recd. March 1926.]

During 1923 and 1924 24 species of mosquitos were captured in New Orleans, and details are given of their relative and seasonal abundance.

The urban mosquitos are *Culex fatigans*, Wied. (*quinquefasciatus*, Say), and *Aëdes argenteus*, Poir. (*aegypti*, L.), the former representing 80 per cent. of the total adult mosquitos captured in 1923 and 45 per cent. in 1924. Its prevalence is dependent on organic pollution, and it breeds chiefly in the open gutters of unpaved streets. The installation of sub-surface drainage and paving was not followed at first by a corresponding decrease in the numbers of this species, and there is evidence that it bred extensively in the sub-surface canals. Oil drippings from motors and oil wastes have, however, now eliminated these breeding-places. *A. argenteus* is fairly abundant during the summer and early autumn ; it breeds in comparatively clean water in stone or wood-lined gutters or receptacles. It does not appear in polluted water until *C. fatigans* has consumed the organisms of pollution.

The sylvan mosquitos include the largest number of species (13), but are unimportant. They breed in temporary pools and ill-drained ditches in the suburbs and will disappear as building progresses.

Of the marsh species those of some importance are *Taeniorhynchus* (*Mansonia*) *perturbans*, Wlk., *Culex salinarius*, Coq., *Aëdes sollicitans*, Wlk., *Anopheles crucians*, Wied., and *A. quadrimaculatus*, Say. The development of *T. perturbans* is favoured by the early stages of drought. *C. salinarius* breeds chiefly in stagnant water, marshy lagoons covered with *Lemna*, *Jussieua*, or other protective vegetation, especially when the water is slightly brackish. It is normally most abundant in early autumn when the vegetation is at its maximum and natural agencies of control are hindered. *Anopheles crucians* and *A. quadrimaculatus* breed usually in similar places, but not always with *C. salinarius* or together. *A. crucians* is more adaptable than *A. quadrimaculatus*, and, being able to tolerate greater salinity, is more abundant in a dry season. In New Orleans both species are usually most abundant in the autumn, when vegetable débris provides food and shelter, but are normally unimportant, except when numbers of *A. crucians* are blown into the city by wind after a drought.

The author considers that the gradual decline and disappearance of indigenous malaria in New Orleans in the last fifteen years has not

been due solely to medical prophylaxis or to drainage (which latter would not account for its disappearance from the suburbs), but that its eradication has been made possible by ecological factors, of which the most important has been the introduction and establishment of the water-hyacinth (*Piaropis crassipes*). The growth of this plant, when crowded, with its stems perpendicular to the surface of the water, makes it unsuitable for the breeding of *Anopheles* ; its shade prevents the development of submerged plants that support the algae on which Anopheline larvae feed, while the roots protect many Dipterous larvae, and small Crustacea, particularly *Chironomus* spp., some of which are predacious on mosquito larvae, and these in their turn support an increased population of the fish, *Gambusia affinis*. [But *cf. R.A.E.*, B, xiv, 31.]

The normal natural habitats of *Aëdes sollicitans* are the salt or brackish marshes, brackish pools and drainage ditches near the coast. The conditions favourable to it are not permanent, and it consequently becomes abundant only periodically, especially when a long drought is followed by a wet spell, drought being responsible for the destruction of many natural enemies of the larvae. On such occasions it is found breeding in pools, etc., where the rotting of the newly submerged terrestrial vegetation provides an abundance of food.

HEADLEE (T. J.). **Why so few Mosquitoes ?**—*Proc. 12th Ann. Meeting New Jersey Mosquito Exterm. Assoc., Atlantic City, 1925*, pp. 50–60, 6 figs. New Brunswick, N.J., 1925. [Recd. March 1926.]

The absence or comparative absence of mosquitos from parts of New Jersey does not warrant the cessation of anti-mosquito work. Of the various factors that influence the abundance of mosquitos the most important is rainfall ; in general, heavy rain is favourable to mosquito breeding, although a low rainfall may cause local abundance. Though the commencement of anti-mosquito work in 1912–15 coincided with a period of high rainfall, a table showing the prevalence of mosquitos in the coastal counties of New Jersey from 1913 to 1922 demonstrates that in those sections where intensive anti-mosquito work has been carried on, mosquitos have been reduced to negligible numbers.

[**Mosquito Control Work and Methods in New Jersey.**]—*Proc. 12th Ann. Meeting New Jersey Mosquito Exterm. Assoc., Atlantic City, 1925*, pp. 78–111. New Brunswick, N.J., 1925. [Recd. March 1926.]

Further papers read included two on dykes and tide-gates, by J. B. Leslie and W. H. Randolph, and others on various phases of control work and local problems by A. H. Cornish, W. E. Darnall, H. G. Van Note, S. T. Dowler and L. W. Smith. W. R. Hudson described the conditions in a reach of the Passaic River into which the untreated sewage from a large town has been carried, until recently, for many years ; this sewage has formed a sludge on the river bottom, 12 feet thick in some places, and its decomposition products support numerous microscopic animals and plants on which the mosquito larvae feed. Mrs. H. Terry also described a large outbreak of mosquitos that was traced to sewage beds. Although these had been regularly oiled, the gases rising from the sewage had destroyed the oil film.

SAMMIS (R. H.). **An Account of some of the Methods developed in Nassau County, New York, during 1924.**—*Proc. 12th Ann. Meeting New Jersey Mosquito Exterm. Assoc., Atlantic City, 1925*, pp. 62–64. New Brunswick, N.J., 1925. [Recd. March 1926.]

This account of anti-mosquito work includes a description of an apparatus for spraying that will carry 50 gallons of oil and can be manipulated by two men.

LANGERON (M.). **Sexualité des larves de moustiques.**—*Ann. Paras. hum. & comp.*, iv, no. 2, pp. 126–135, 8 figs., 4 refs. Paris, 1st April 1926.

Malariologists do not seem to have paid any attention to the sex of mosquito larvae, although they have studied the sex of adults in establishing statistics of male and female incidence at different seasons and in different habitats, and deduced from these statistics the theory of residual Anophelism [*R.A.E.*, B, xiii, 142]. In studying mosquito larvae from France and the Mediterranean basin, the author has found that the testicles are clearly marked in even very young male larvae, their form and structure (which are discussed and figured for several species) differing in Anophelines and Culicines as well as between different genera of each group. These organs are highly pigmented and are easily visible in the transparent living larva, and they enable the sex to be recognised immediately.

LARROUSSE (F.). **Description de deux espèces nouvelles du genre** *Triatoma*: *T. carrioni*, **n. sp., et** *T. pintoi*, **n. sp.**—*Ann. Paras. hum. & comp.*, iv, no. 2, pp. 136–139, 4 figs. Paris, 1st April 1926.

Descriptions are given of *Triatoma carrioni*, sp. n., from Ecuador, and of *T. pintoi*, sp. n., from Florida.

DE BUEN (S.). **Note préliminaire sur l'épidémiologie de la fièvre recurrente espagnole.**—*Ann. Paras. hum. & comp.*, iv, no. 2, pp. 185–192. Paris, 1st April 1926.

A study of relapsing fever in Spain has shown that it is endemic and wide-spread in that country, closely resembling in its clinical aspect the African form of the disease. The European form, which is transmitted by lice, apparently does not occur in Spain. A species of *Ornithodorus*, resembling or identical with *O. marocanus*, has been found in almost all the localities infected, and the author's experiments have proved that this species is the vector of Spanish relapsing fever. The cycle of development of the spirochaete in the tick is being investigated. An experiment to determine whether pigs may be the reservoir of the virus proved negative. The spirochaete causing the disease resembles *Spirochaeta* (*Treponema*) *duttoni*, and is provisionally named *S.* (*Borrelia*) *hispanicum*, sp. n.

EWING (H. E.). U.S. Bur. Ent. **The Common Box-turtle, a Natural Host for Chiggers.**—*Proc. Biol. Soc. Wash.*, xxxix, no. 6, pp. 19–20. Washington, D.C., 23rd February 1926.

The larvae of *Trombicula irritans*, Riley, are recorded from Maryland on the common box-turtle, *Terrapene carolina*. The mites engorge

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rapidly on this host and drop off easily in contradistinction to their behaviour on snakes, on which they engorge very slowly and from which they detach themselves with difficulty. Chiggers on snakes, which moult several times during the season, are periodically destroyed, but the box-turtle moults only once, and normally in the autumn after the season of these mites is over.

Ewing (H. E.). U.S. Bur. Ent. **Key to the known Adult Trombiculas (Adults of Chiggers) of the New World with Descriptions of Two New Species (Acarina, Trombidoidea).**—*Ent. News*, xxxvii, no. 4, pp. 111–113. Philadelphia, Pa., April 1926.

Trombicula alleei, sp. n., is described from the Panama Canal Zone and *T. peruviana*, sp. n., from Peru, both from adults. A key is given to the adults of the New World species of *Trombicula* which, with the above new species, are *T. irritans*, Riley, *T. coarctata*, Berlese, and *T. splendens*, Ewing.

Zebrowski (G.). **A Preliminary Report on the Morphology of the American Dog Tick.**—*Trans. Amer. Ent. Soc.*, li (1925), no. 4, pp. 331–369, 3 pls., 2 figs., 12 refs. Philadelphia, Pa., 1926.

The American dog tick, *Dermacentor variabilis*, Say, is recorded from Canada, the Eastern and Central United States and Mexico. All ticks that have been taken on dogs from the Panama Canal Zone belong the genus *Haemaphysalis* so that it is doubtful if *D. variabilis* extends so far south. Cattle, horses and man are also attacked by *D. variabilis*.

The morphology of the adult is dealt with in detail, and the specific characters of both sexes of the adult and of the immature stages are described.

During July females in captivity deposited masses of eggs which hatched in 25–32 days at room temperature, but a very high mortality occurred among them, apparently owing to non-fertilisation and to growth of moulds. It is thought that possibly the larger eggs give rise to female ticks, and also that the sex of the larvae can be determined from a study of the mouth-parts.

Wille (J.). **Garrapatos e Garrapaticidas.** [Ticks and Tick Poisons.] —*Egatea*, xi, no. 1, pp. 26–32, 2 figs. Porto Alegre, January–February 1926.

Ticks are an important factor affecting cattle raising in South America. The most injurious species in Brazil is *Boophilus annulatus*, Say. A brief account of the morphology and habits of this tick are given, with notes on dipping and a short report on laboratory tests with some proprietary dips.

Quarantine Proclamation, no. 153.—*Commonw. Australia Gaz.*, no. 3, 1 p. Melbourne, 21st January 1926.

The removal of live poultry from Western Australia into any other part of the Commonwealth is prohibited, unless accompanied by a certificate of freedom from *Echidnophaga gallinacea* (stickfast flea) and forwarded in new receptacles.

GURNEY (W. B.) & WOODHILL (A. R.). **Reports of the External Parasites in Sheep Committee of the Departmental Research Council. No. iii. Biological Notes on Sheep Blowflies in the Moree District.**—*Agric. Gaz. N.S.W.*, xxxvii, pt. 2, pp. 135–144. Sydney, 1st February 1926.

The following is the authors' summary of this paper: Five species of blowflies were found to be present in every month of the year, but great fluctuations in the relative numbers were recorded in the north-west district (Moree). *Chrysomyia albiceps* was predominant during the summer, and *Anastellorhina augur* and *Pollenia* (*Neopollenia*) *stygia* (the yellow-bodied species) during the winter. *Lucilia sericata*, one of the green species, was at its numerical maximum in spring and again in autumn. Females were much more readily trapped than males. The blowflies may be present in large numbers, but during dry, hot weather they rarely attack sheep. Attacks in sheep were found to be most severe after rain and during warm, humid weather, and therefore infested sheep were generally recorded when green feed and water were plentiful. *L. sericata* proved a more serious pest than was indicated by the comparatively limited number captured in the traps. The blowflies were more abundant in timbered than in open country during the extremes of heat or cold and were more numerous near permanent water in either class of country during dry weather. The periods required for blowflies to pass through the larval and pupal stages varied from 22 to 32 days in the cooler months, and from 11 to 16 days during the warmer months. The evidence points to the parasite, *Mormoniella* (*Nasonia*) *brevicornis*, being inadequate for control of blowflies under field conditions, even when supplemented by artificially bred individuals. The introduction and trial of parasites from abroad is advocated. It is found that the maggots of *Chrysomyia albiceps* will feed on the smooth-bodied maggots of other blowflies, though they feed mainly on carrion or the sheep they infest. The Histerid beetle, *Saprinus laetus*, is not only a carrion eater, but both the larvae and adult feed on the pupae of blowflies.

Some specimens of the Braconid parasite, *Alysia manducator*, were received through the Imperial Bureau of Entomology; they failed to infest larvae of *Calliphora erythrocephala*, *L. sericata*, *A. augur*, or *Musca domestica*, though it is hoped that more success may be obtained with a further consignment.

HUYNEN (E.). **De la Gale sarcoptique chez la bête bovine. Sa transmission à l'homme.**—*Ann. Méd. vét.*, lxxi, no. 2, pp. 56–60. Brussels, February 1926.

The author has been studying for some years a sarcoptic form of mange in cattle which is apparently not an accidental infection from some other animal, but is rather exclusive to cattle and is readily transmissible to man. The mites, which are of large size, can be seen in various stages of development by microscopical examination of the crusts formed on the affected parts or of skin scrapings. The infection is particularly contagious and persistent; it seems to disappear completely during the summer, only to reappear at the beginning of winter. Horses, placed experimentally in close and constant contact with infected cattle, did not contract the disease, but women milking infected cows have frequently become infected,

generally on the arms, but sometimes all over the body. The best remedy found for this infection is a mixture of Peru balsam, salicylic acid and vaseline, which should be rubbed on the affected parts for three consecutive days, followed on the fifth day by an alkaline soap wash, the treatment being repeated after an interval of two days on any areas not cured. This treatment is generally completely successful within a fortnight.

MARCOVITCH (S.). **The Control of Poultry Lice and Mites.**—*Tennessee Agric. Expt. Sta.*, Circ. no. 2, 2 pp. Knoxville, Tenn., February 1926.

A very simple method that has proved successful in freeing poultry from lice is the use of a dust bath containing sodium fluosilicate. An ordinary tub, containing 3 parts of finely ground phosphate rock to one part of sodium fluosilicate (or ordinary rock dust in place of the phosphate rock) was placed in one corner of a pen containing fowls badly infested with lice. In about 6 weeks about 60 per cent. of the hens were free from lice and within 8 months almost all of them were free. A few still showed the presence of lice, apparently because some birds seldom use a dust bath, and this seems to be the principal disadvantage of the method. Used by the pinch method, 1 lb. of sodium fluosilicate is sufficient to treat about 100 birds, and in the present experiments this substance proved superior to sodium fluoride and is also cheaper and effective for a longer time. For dipping birds, ¾ to 1 oz. should be dissolved in 1 gal. of warm water; from 20 to 30 seconds in the bath is enough, the head being merely ducked once. To control mites, the poultry houses and roosts should be cleaned, and then sprayed with 5 gals. kerosene with 1 pint creosote; or crude petroleum or old crankcase oil thinned with kerosene could be used. The roosts should be sprayed every week and the whole house every three months. Commercial carbolineum is also very effective, but more expensive. Poultry should be kept away from the spray and out of the treated buildings until the material has dried into the wood.

LEENEY (H.). **Diseases of Poultry (Second Series) III. External Parasites. IV. Acarina–Mites.**—*Pharm. Jl. & Pharmacist*, cxvi, no. 3255, pp. 262–263, no. 3258, pp. 359–360. London, March 1926.

This is a review from the literature of the infestation of fowls by mites and gives particulars of the usual remedies for their control.

JOHNSON (C. W.). **The Distribution of *Muscina pascuorum* Meigen in America.**—*Psyche*, xxxiii, no. 1, pp. 20–21. Boston, Mass., February 1926.

The distribution of *Muscina pascuorum*, Meig., in the United States and Canada is briefly reviewed, and it is suggested that the species is probably frequently overlooked, as so many Muscids are similar in appearance and have the same habit of entering houses as the weather becomes cool in the autumn. Its life-history in America is still unknown.

Jepson (F. P.). **The Fly Nuisance on Estates in Ceylon.**—*Yrbk. Dept. Agric. Ceylon 1926*, pp. 54–56. Peradeniya, 1926.

The following investigation was made in view of a suggestion that the swarms of flies, which are almost invariably associated with manuring operations on estates in Ceylon, originated in manure brought from Colombo, and that the causal organisms of dysentery, serious outbreaks of which disease coincided with the prevalence of flies in 1923 and 1924, had the same origin.

The organic manures supplied by one factory were examined, and it was found that flies were present in very small numbers in the factory and that samples of the raw materials and of the manure taken at several points on the journey to its final destination failed to produce any flies. It was also found that the manure could not contain the living organism of dysentery. The composition of the manure tested was of two types, one containing fish guano and one containing ground-nut cake in place of this; various other organic materials were present in both.

Samples of both the above manures were taken after they had been exposed in a field for 24 hours; the mixture containing fish guano yielded enormous numbers of flies 8 days later, but that containing ground-nut cake failed to produce any flies, and it was proved that the flies that appeared from the manure were not introduced with it, but were the progeny of those already present on the estate.

As it appeared that moisture was a necessary factor for the development of flies in manure, a large number of organic manures and mixture containing organic substances were exposed in duplicate in Colombo, one sample of each being kept dry and the other being moistened. After exposure for 24 hours each of these samples was covered up so that no flies could gain access, and none could escape except into a fly trap that was fixed to each. In every case large numbers of flies were obtained from the moistened samples, while not a single one was obtained from the dry samples. Larvae that had developed from eggs laid in a suitable medium died in a short time when placed in dry manure. It is therefore evident that it is impossible for flies to be transported in manure provided that it is kept dry.

Chevalier (L.). **Note sur la biologie et la manière de vivre de trois espèces d'Oxybèles.**—*Bull. Soc. Sci. Seine & Oise*, (2) vii, no. 1, pp. 1–13, 4 refs. Versailles, 1926.

Lists are given of the Muscid and other flies found near Paris in the nests of the Sphegid wasps, *Oxybelus uniglumis*, Latr., *O. bipunctatus*, Ol., and *O. quatuordecimnotatus*, Jur. *O. bipunctatus* is parasitised by *Perilampus ruficornis*, F.

Cleveland (L. R.). **Some Problems which may be studied by Oxygenation.**—*Science*, lxiii, no. 1623, pp. 168–170. Garrison, N.Y., 5th February 1926.

The part that many insects are able to play in the transmission of protozoa may be worked out by confining them in oxygen under pressure, since experiments show that this gas is much more toxic to protozoa in insects than to the insects themselves [*cf. R.A.E.*, B, xiii, 134].

ENDERLEIN (G.). **Neue Beiträge zur Kenntnis paläarktischer Simuliiden.** [New Contributions to the Knowledge of Palaearctic Simuliids.]—*Zool. Anz.*, lxvi, no. 5–6, pp. 139–142. Leipzig, 20th March 1926.

The Simuliids described are *Simulium* (*Cnetha*) *pritzkowi*, sp. n., from Scandinavia, *S.* (*C.*) *albipileata*, sp. n., and *S.* (*C.*) *schielei*, sp. n., from Hanover, *S. mehelyi*, sp. n., from Hungary, and *S. behningi*, sp. n., from South Russia.

[RITCHIE (A. H.).] **Entomological Report, 1924-25.**—*Tanganyika Terr. Rept. Dept. Agric. 1924–25*, pp. 41–44. Dar-es-Salaam [1925]. [Recd. March 1926.]

A Limacodid supposed to cause the death of cattle and goats has been identified as *Parasa vivida*, Wlk. The following Tabanids are to be added to Morstatt's list [*R.A.E.*, B, ii, 43]: *Tabanus conspicuus*, Ric., *T. insignis*, Lw., *Haematopota pertinens*, Aust., *Chrysops austeni*, Neave, and *C. wellmani*, Aust.

FERGUSON (E. W.). **Additional Notes on the Nomenclature of Australian Tabanidae.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 293–306, 12 figs. London, March 1926.

Since the publication of a previous paper on the subfamily PANGONIINAE [*R.A.E.*, B, xii, 84], the author has seen a paper by Coquillet (1910) on the type species of North American genera of Diptera, in which the type species are designated for all of Walker's subgenera of *Pangonius*, thus invalidating his own designations in the paper quoted.

In the present paper the author analyses Enderlein's classification of the TABANIDAE [*R.A.E.*, B, x, 226] and, in an addendum, a later paper on the same subject [*R.A.E.*, B, xiii, 70].

The author appends to the present paper a list of the genera of PANGONIINAE that he recognises as occurring in Australia, with the names relegated to synonymy. The synonyms are to be understood to apply to Australian species only, as in some cases these names have valid status in other faunal regions. The anatomy of the head of several species of *Scaptia* is discussed in detail, with figures.

AUSTEN (E. E.). **Concerning the Nomenclature and Synonymy of certain Oriental and East African Bloodsucking Muscids (Diptera).**—*Bull. Ent. Res.*, xvi, pt. 4, p. 307. London, March 1926.

It is pointed out that *Bdellolarynx sanguinolentus*, Aust., has priority over *Haematobia nudinervis*, Stein, as it was described in 1909, and not in 1919 as supposed by Patton [*R.A.E.*, B, xiii, 162]. *Bdellolarynx*, Aust., is also considered distinct from *Haematobia*, R.-D.

BOYD (M. F.). **A Note on the Rearing of Anopheline Larvae.**—*Bull. Ent. Res.*, xvi, pt. 4, p. 308. London, March 1926.

Anopheline larvae may be successfully reared from the egg by feeding them on Fleishman's yeast instead of on algae or comminuted insects as is generally done. A small amount of the yeast is rubbed into the superficial layer of the water in the culture pan daily. Marble

dust preserves the alkalinity of the water, but where it is not in circulation it should be changed every 2 or 3 days to avoid its becoming foul from decomposing yeast.

The optimum temperature for larvae of *Anopheles quadrimaculatus* and *A. crucians* appears to be between 70° and 80° F. At 85° F. the mortality is high. It was found best to separate the larvae of different sizes.

A convenient method of securing the desired temperature and the aeration of the water is described.

MacGregor (M. E.). **Some Effects of Electric Current on Mosquito Development.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 315–317. London, March 1926.

Wide variations in the pH index can be created in certain waters from natural mosquito breeding-places by the use of electric currents. It is effected by the electrolysis of the inorganic and organic compounds naturally present in these waters. At a voltage of 100 and a roughly estimated current of 250 milliamperes passing through swamp water, the larvae of *Aëdes* (*Ochlerotatus*) spp. are violently affected. They eventually lose muscular control and appear to be dead after about 5 minutes, but if removed to uncharged water they usually recover completely within 15 minutes and in most cases develop normally. If allowed to remain in the charged water more than 5 minutes they invariably die. At from 2 to 6 volts the larvae could continue development.

Should one of the oxygen bubbles that becomes detached from the positive electrode get entangled with the mouth-brushes of a larva and not be large enough to carry it immediately to the surface, the insect makes violent efforts to swim to the bottom of the water, being evidently guided by the downward position of the siphon, which under normal conditions is lighter and would lead it to the surface. Conscious appreciation of the situation of the surface film evidently, therefore, does not exist in Culicine larvae.

As Anopheline larvae assume a roughly horizontal position and are surface feeders, they are not affected in this way.

The eggs of mosquitos seem to be unaffected by electric currents.

Stackelberg (A.). **Notes on the Genus** *Chrysops* **(Diptera, Tabanidae).**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 325–328, 1 fig., 2 refs. London, March 1926.

Chrysops binoculatus, Szilady, is considered to be a synonym of *C. amurensis*, Plsk., and *C. sakhalinensis*, Plsk., to be only a dark form of *C. suavis*, Lw. Other synonymy discussed is *C. punctifer*, Lw. (*maculiventris*, Beck.) and *C. makerovi*, Plsk. (*loewi*, Kröb.).

Descriptions are given of the males of *C. dissectus*, Lw., from Manchuria and of *C. oxianus*, Plsk., from Russian Turkestan.

C. (*Turanochrysops*) *hyalipennis*, subgen. et sp. n., is described from Transcaspia.

Macfie (J. W. S.). **Ceratopogoninae from Dar-es-Salaam.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 355–357, 1 fig. London, March 1926.

The species recorded include *Forcipomyia corsoni*, sp. n.

King (H. H.). **A Note on the Bionomics of** *Tabanus fasciatus niloticus*, **Aust.**—*Bull. Ent. Res.*, xvi, pt. 4, p. 359. London, March 1926.

The larva and pupa of *Tabanus fasciatus niloticus*, Aust., are described. The larvae were found lying submerged in the water supported on the bases of the lower leaves of *Pistia stratiotes* in the White Nile.

Adler (S.) & Theodor (O.). **On the** *minutus* **Group of the Genus** *Phlebotomus* **in Palestine.**—*Bull. Ent. Res.*, xvi, pt. 4, pp. 399–405, 6 figs., 10 refs. London, March 1926.

In a number of *Phlebotomus* collected at Jericho from June to December 1925 3 different types of palpal formulae were found that could not be regarded as representing varieties of a single species. Their internal morphology was also markedly different, and investigation showed that the characters of the pharynx, buccal cavity and spermathecae exhibit important specific differences in the females. As a result *P. minutus africanus*, Newst., is raised to specific rank, the other species present being *P. minutus*, Rond., and another undetermined species of this group.

Smith (R. C.). **House Fumigation with Calcium Cyanide.**—*Jl. Econ. Ent.*, xix, no. 1, pp. 65–77, 5 refs. Geneva, N.Y., February 1926.

From experiments described it is concluded that calcium cyanide is a promising substitute for sodium cyanide for house fumigation. It was found that 2 lb. of calcium cyanide granules ("G grade") to 1,000 cu. ft. of space, applied by spreading thinly on dry papers in tightly closed rooms, and left for 24 hours, would give satisfactory results. Among the insects killed by this treatment were fleas, including the dog-flea [*Ctenocephalus canis*, Curt.], bed-bugs [*Cimex lectularius*, L.] and cockroaches as well as other household pests and various insects brought in from out of doors as controls. Cockroaches were found in one house after treatment, but this was probably due to re-infestation from neighbouring premises.

Fantham (H. B.). **Some Flagellates in Plants.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xix, no. 7, pp. 347–348. London, 1926.

A flagellate, probably a strain of *Herpetomonas* (*Leptomonas*) *davidi*, is recorded from the latex of *Euphorbia striata*, and *H. ficuum* from that of *Ficus edulis* in South Africa. Flagellate, non-flagellate and multiplicative forms have been seen.

The plants appeared to be healthy, and the infection in each case was very local.

MacArthur (W. P.). **Old-time Plague in Britain.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xix, no. 7, pp. 355–372. London, 1926.

This informal address, delivered entirely without notes, even to the quotations cited, forms a most interesting account of plague in Britain, its effect on the nation as reflected in history and literature, and its close connection with rats and fleas.

In discussing the bionomics of fleas, it is pointed out that the egg, larval and pupal stages are generally free and independent in the nest or other habitation of the host. Thus, animals such as monkeys and deer, which under natural conditions have no permanent home, are normally free from fleas, but are usually swarming with lice.

The larvae of certain fleas such as *Ceratophyllus fasciatus* require blood for their development, and this they obtain from the faeces of the parent. This necessity for providing the larva with food modifies the habits of such fleas so that, instead of accompanying their host, they tend to remain in the nest to provide for the wants of their offspring. In the case of fleas such as *Xenopsylla cheopis*, the larvæ do not require blood, so that there is no reason for the adult to leave the host. Such fleas may become widely distributed and are much more dangerous from the point of view of disease transmission. This difference of habits should be taken into consideration when taking a flea census on rats.

SHARP (N. A. D.). **A Contribution to the Study of *Onchocerca volvulus* Leuckart, with some Observations on its Prevalence in Nigeria.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xix, no. 7, pp. 373–388, 1 pl., 2 figs., 20 refs. London, 1926.

The following are some of the author's conclusions: Onchocerciasis is not confined to persons exhibiting obvious tumours or skin affections, and is, moreover, far more common than has hitherto been described. The embryo is more often found in the skin than in definite tumours. The larvae of *Onchocerca volvulus* occur with great frequency in hydrocele fluid in Nigeria, and, while possibly innocuous, they may well stand in some causal relationship to this condition as well as to elephantiasis.

CURSON (H. H.). **A Note on the Occurrence of *Trypanosoma vivax* in the Bechuanaland Protectorate.**—*S. Afr. Jl. Sci.*, xxii, pp. 268–269, 1 map, 5 refs. Johannesburg, November 1925. [Recd. March 1926.]

Blood-smears taken from fly-struck cattle in the Bechuanaland Protectorate have revealed the presence of *Trypanosoma vivax* and *T. congolense*. This with previous records indicates that *T. vivax* is as wide-spread south of the Zambesi river as it is in Central Africa. The tsetse–flies concerned proved to be *Glossina morsitans*.

JACK (R. W.). **Tsetse Fly in the Lomagundi District. Experimental Operations.**—*Rhodesia Agric. Jl.*, xxiii, nos. 2 & 3, pp. 134–150 & 257–267, 1 map, 4 pls.; also [S. Rhodesia] *Minist. Agric. & Lands*, Bull. 587, 28 pp., 4 pls. Salisbury, February & March 1926.

Heavy losses have occurred among cattle by the spread of tsetse fly [*Glossina morsitans*] in the Lomagundi district of Rhodesia. At a conference held at Salisbury, as the limit of the definite fly area extends in a salient southward between the Hunyani and Angwa Rivers, the plan

decided on was to interpose a gameless, buffer zone between this salient and the farms of the settled area. A fence of barbed wire 6 ft. high has been erected between the two rivers along the edge of the settled country, with a second one running roughly parallel 10 miles further north. The forest for 50 yards on either side of the fence has been cleared by chopping and on the outside of the fence a brushwood barrier 6 to 8 ft. high has been piled on the edge of the clearing, in order to break the rush of stampeding game and to keep out smaller animals. A drive was then carried out by 300 natives across the 10 miles between the fences, from one river to the other, during four days. So far as the larger antelope were concerned, the drive was decidedly successful. A few that made their way back are being dealt with by hunters. The fenced area is occupied only by natives, and as a supplementary measure their cattle, sheep and goats have been evacuated.

The main object of these operations is the speedy relief from losses among cattle (rather than scientific elimination of fly or game), and if the situation appears to have been definitely ameliorated, the cattle on the farms will no doubt be allowed in time to return to their former range, and the gradual re-introduction of cattle into the fenced zone will furnish information as to whether the country has been rendered safe for stock or not. The extension of the fenced zone northwards would be the logical development if the present experiment proved successful, and would be comparatively simple as only one fence would be needed. If it were possible to establish the fact that the control of tsetse is practicable, Europeans could then be induced to take up farms beyond the present limit of settlement, some of the areas beyond being very desirable but for the presence of tsetse and offering good prospects for the growing of cotton as well as other crops. The first step in any case is to prevent retrogression of the present limit of European cultivation, which would inevitably follow further encroachment of the tsetse-fly.

It is pointed out that owing to somewhat different conditions in Southern Rhodesia, where the native population is very scanty in the fly areas, and where in some of the worst infested parts there is very little grass, the measures, such as systematic grass burning, etc., that have been found so successful in Tanganyika Territory, are less readily applicable.

HORNBY (H. E.) & BURNS (W. A.). **An Attempt, with the aid of Drug Treatment, to keep Cattle in a Tsetse-fly Belt.**— *Jl. Comp. Path. & Therap.*, xxxix, pt. 1, pp. 30–38. London, March 1926.

In connection with the use of oxen to plough cleared land under the new system of clearing and subsequent cultivation of fly-infested bush in Shinyanga [*R.A.E.*, B, xiii, 105] and the fact that these animals frequently work close to uncleared bush and are liable to be attacked by fly, experiments are described which prove that by means of fortnightly injections of tartar emetic, cattle can be kept alive in a fly-belt for a number of months without losing much condition. Advantage might be taken of this when running slaughter cattle through a fly-belt, but it is unlikely that oxen thus treated could be worked economically within the belt. The addition of " Bayer 205 " to the tartar emetic was of no advantage.

JOLLY (G. G.). **An Entomological Episode of the East African Campaign.**— *Indian Med. Gaz.*, lxi, no. 4, pp. 164-165. Calcutta, April 1926.

In an encampment on an old site, which proved to be heavily infested with chigger fleas [*Tunga penetrans*, L.], the only effective measure was found to be for the men to go about barefoot as much as possible, with a daily foot inspection and chigger removal. By the end of a week there was a noticeable reduction in infections, and after a month the pest was practically negligible and the number of chiggers removed daily from 100 men had dwindled from 315 to 5. The success of this measure depended on the fact that this flea can only breed in the body of its host. This was prevented by the daily removal of the females before they had time to develop their eggs, and reinfection was avoided by the comparative absence of other suitable hosts.

PINTO (C.). **Estudos sobre siphonapteros ou "pulgas," *Stenopsylla cunhai* n. sp.** [Studies on Siphonaptera or Fleas.]—*Bol. Instit. brasil. Scien.*, i, no. 3, pp. 3–7, 4 figs. Rio de Janeiro, 8th January 1926.

Stenopsylla cunhai, sp. n., from *Didelphis opossum* is described from Brazil.

Comptes rendus du 5-ième Congrès antipesteux organisé à Saratov par l'Institut de Microbiologie et Epidémiologie d'Etat du Sud-Est de l'URSS de 5 à 9 Octobre de 1925.—301 pp., numerous maps. Saratov, 1926.

The papers in this volume are in Russian, with extensive summaries in French, German or English. Those dealing with the entomological aspect of plague in south-eastern Russia have already been noticed [*R.A.E.*, B, xiv, 66, 67].

Only an abstract of the paper by Golov & Ioff is given, but that by Ioff as here published contains additional information concerning the seasonal history of *Ceratophyllus tesquorum*, Wagn., *Neopsylla setosa*, Wagn., and *Ctenophthalmus breviatus*, Wagn. (MS.). All these fleas are found in the burrows of *Citellus mugosauricus* in much larger numbers than on the animals themselves, their abundance increasing in the summer and particularly in the autumn; this corresponds with the development of plague epidemics among the rodents. *C. breviatus* is also constantly found on *Lagurus lagurus* and may possibly be a vector of plague between this animal and *Citellus mugosauricus*. The fleas studied were found to harbour Herpetomonads, probably intermediate developmental stages of the trypanosome of *C. mugosauricus*; they were also infested by mites.

The majority of the plague-infected rodents die above ground, but the few fleas found on them cannot be of any great importance in the dissemination of the disease. It is possible, however, that the fleas in the burrows acquire the infection from infected animals and transmit it to healthy ones. The question whether the fleas come out of the burrows to the surface of the soil requires further study, but the existence of infected fleas in the burrows suggests the necessity of

disinfecting empty as well as inhabited burrows. It is possible, however, that the greatest risk of infection is by mechanical means, such as the soiling of hands or mucous membranes whilst skinning the animals, etc.

COMPTON (A.). **Phthiriasis of the Mouse : *Haematopinus muris*, with Observations on Treatment with Salicylidene Compounds.**— *Vet. Jl.*, lxxxii, no. 5, pp. 255-257, 2 figs., 2 refs. London, May 1926.

What is considered by the author to be a new louse, *Haematopinus muris*, sp. n., is described from specimens from laboratory-bred mice in London. Mice infested with this louse, which is found especially on the forehead, around the eyes, at the back of the neck, and behind the ears, but frequently over the entire body, become lethargic, presenting the appearance of suffering from vitamin deficiency, and eventually die.

Excellent results against this parasite were obtained by applying a 1 per cent. solution of salicylidene m-toluidine in alcohol or petrol; the latter has the advantage of evaporating more quickly, in addition to the fact that it, itself, possesses insecticidal properties. Equally good results were obtained with a saturated solution (about 1 per cent.) of salicylidene p-amino benzoic acid in equal parts of alcohol and petrol. These solutions were applied to the infested parts of the mice with cotton-wool swabs.

Insects and Parasites affecting Livestock.— *38th Ann. Rept. Texas Agric. Expt. Sta., 19*[*24-*]*25*, p. 18. College Station, Texas, 1925. [Recd. April 1926.]

In a study of sheep scab it has been found that infestations develop very slowly in hot and dry periods. Sheep may carry the sheep scab mite [*Psoroptes ovis*, Hering] in an apparently dormant stage for a number of weeks. The results so far obtained agree, in the main, with those obtained in South Africa [*cf. R.A.E.*, B, iv, 184-187].

VITZTHUM (H.). **Malayische Acari.**—*Treubia*, viii, no. 1-2, pp. 1-198, 111 figs. Buitenzorg, January 1926.

This list of Malayan mites comprises 58 species, of which 26 are new to science.

WAGENER (E. H.) & KOCH (D. A.). **The Biological Relationships of *Leishmania* and certain Herpetomonads.**— *Univ. California Pubns. Zool.*, xxviii, no. 20, pp. 365-388, 4 pls. Berkeley, Cal., 1926.

The following is from the author's summary : On N.N.N. culture media *Leishmania* and *Herpetomonas ctenocephali* pass through a similar life-cycle, the division of the stages of both being a small spherical form. *Leishmania* requires from 21 to 30 days to complete its cycle, while only 8 to 10 days is required by *H. ctenocephali*. All the Herpetomonads studied have short flagella, never more than the length of the body. The flagella of *Leishmania* are from one to six times the length of the body.

Cross-agglutination tests between the species of *Leishmania* (*L. donovani, L. tropica, L. infantum* and *L. brasiliensis*) and *H. ctenocephali* show no biological relationship to exist between the two genera.

Five strains of *Leishmania* all show marked group reactions in the presence of antisera of any member of the genus.

Rabbits sensitised to any strain of *Leishmania* give positive skin reactions to antigens of all of the group. No intradermal reaction was obtained with antigens of *H. ctenocephali* or *Trypanosoma lewisi*. Guineapigs may also be sensitised to both *Leishmania* and *Herpetomonas*.

Attempts to infect mice experimentally with cultures of *Leishmania* or *H. ctenocephali* or with flagellates from the guts of insects failed.

Austen (E. E.). **The House-fly, its Life-history, Importance as a Disease Carrier and Practical Measures for its Suppression.**—*Brit. Mus. (Nat. Hist.), Econ. Series*, no. 1a, 68 pp., 2 pls., 6 figs., numerous refs. London, 2nd edn., 1926. Price 1*s*.

The first edition of this pamphlet appeared under a slightly different title [*R.A.E.*, B, viii, 177]. In the present edition the text has been revised and expanded in an endeavour to keep pace with modern research. Brief notes are included on the insect enemies of house-flies, and on the connection of house-flies with *Habronema* in horses, and possibly with anthrax, hog cholera, swamp fever in horses, and tapeworms in poultry.

Sasaki (C.). **Flies frequenting Houses.** [*In Japanese.*]—*Dobutsugaku Zasshi* [*Zool. Mag.*], xxxviii, no. 447, pp. 34-36. Tokyo, January 1926.

A popular account is given of *Musca domestica*, *Fannia canicularis*, and *Calliphora erythrocephala*, which are common in houses in Japan.

Seddon (H. R.). **Reports of External Parasites in Sheep Committee of the Departmental Research Council. No. 1. Tests of certain Swabbing Dressings for Prevention and Treatment of Sheep Blow-fly Attack.**—*Agric. Gaz. N.S.W.*, xxxvii, pts. 1 & 3, pp. 37-44, 237-244. Sydney, 1st January & 1st March 1926.

The results are given of a number of tests with seven different proprietary preparations for the destruction of blow-fly larvae in sheep and the protection of sheep from infestation ; the approximate composition of each of the preparations is indicated. The value of each dressing in protecting the sheep from attack, in destroying the larvae, and in healing the wound caused by them, and its toxicity to the sheep, effect on the wool, ease of application, and persistence, is noted. No dressing was found consistently to be satisfactory in all respects, and, although numerous tests were made, in many of them the incidence of the fly was not sufficiently great for a satisfactory conclusion to be drawn.

Cook (W. C.). **The Effectiveness of certain Paraffin Derivatives in Attracting Flies.**—*Jl. Agric. Res.*, xxxii, no. 4, pp. 347-358, 4 figs. Washington, D.C., 15th February 1926.

The author's summary of this paper is as follows : The experiments herein reported, in which over 50,000 flies were captured, have demonstrated the following points regarding the attraction of flies by organic

chemicals of the paraffin series. There is a definite optimum concentration for each compound studied. This concentration is related to the boiling point of the compound, and becomes smaller as the boiling point rises. The relative attractiveness of paraffin alcohols and esters is also related to the boiling points of the compounds. As the boiling point becomes higher, the attractiveness decreases. This relation is somewhat obscured by two other relations : (*a*) the addition of a CH_2 group to the acid radical reduces the attractiveness much more than the addition of a similar group to the alcohol radical ; (*b*) of a given set of isomeric compounds, that one is generally most attractive which has the lowest acid radical, this being a corollary of (*a*).

Iso or branched-chain compounds are relatively more attractive than their normal isomeres.

Austen (E. E.). **Zoological Results of the Swedish Expedition to Central Africa 1921. Insecta. 19. Tabanidae et Glossininae (Diptera).**—*Ark. Zool.*, xviii B, no. 6, pp. 1-4. Stockholm, 1926.

The following Tabanids are additions to the list for Tanganyika Territory : *Haematopota inornata*, Aust., *H. furva*, Aust., *Tabanus irroratus*, Surc., *T. marmoratus*, Surc., and *T. secedens*, Wlk.

Goetghebuer (M.). **Catalogue des Tabanides de Belgique.**—*Bull. & Ann. Soc. ent. belg.*, lxvi, pt. 3, pp. 109-114. Brussels, 31st March 1926.

This list of Belgian Tabanids records 30 species.

Nieschulz (O.). **Zoölogische bijdragen tot het Surraprobleem. I. Experimenteele overbrenging van** *Tryp. evansi* **door** *Tabanus stantoni* **Ricardo en** *T. ceylonicus* **Schiner.** [Zoological Contributions to the Problem of Surra. I. The Experimental Transmission of *T. evansi* by *Tabanus stantoni* and *T. ceylonicus*.]—*Dept. Landbouw, Veeartsenijk. Meded.*, no. 53, 7 pp., 1 pl. Buitenzorg, 1925. (With a Summary in German.) [Recd. April 1926.]

The experimental transmission from horse to horse of *Trypanosoma evansi*, the causal organism of surra, with *Tabanus stantoni*, Ric., and *T. ceylonicus*, Schin., is recorded in Sumatra.

Nieschulz (O.). **Zoölogische bijdragen tot het Surraprobleem. II. Over de ontwikkeling van** *Tabanus rubidus* **Wied.** [Zoological Contributions to the Problem of Surra. II. The Development of *T. rubidus*.]—*Dept. Landbouw, Veeartsenijk. Meded.*, no. 54, 31 pp., 5 figs., 4 pls., 12 refs. Buitenzorg, 1926. (With a Summary in German.)

The development of *Tabanus rubidus*, Wied. (*albimedius*, Wlk.) has been observed from egg to adult at the Veterinary Laboratory, Buitenzorg. The experimental transmission of *Trypanosoma evansi* with this fly has been effected both by workers in India and by the author in Java. The eggs were laid in batches of 386-553 and take 6 days to incubate. The optimum time for oviposition was from 10 a.m. to 2 p.m. Near Buitenzorg the eggs were found on rice-stalks

in flooded fields. A Hymenopterous egg-parasite, *Phanurus* sp., was noticed. *T. rubidus* has 7-8 larval instars. Where an 8th occurred there were 81 per cent. of females as compared with 53 per cent. in larvae without this instar. The pupal stage lasts 9-13 days. Of 85 adults bred from eggs 40 were males and 45 females. The longest life of a captive female observed was 40 days. The deposition of the first (unfertilised) eggs occurred 14, 16 and 24 days after emergence.

DE BUEN (S.). **Note préliminaire sur l'épidémiologie d'une fièvre récurrente à tiques, en Espagne.**—*Bull. Acad. Méd.*, xcv, no. 11, p. 284. Paris, March 1926.

This paper has already been noticed from another source [*R.A.E.*, B, xiv, 89].

WOLBACH (S. B.). **The Rickettsiae and their Relationship to Disease.** *Jl. Amer. Med. Assoc.*, lxxxiv, pp. 723-728, 25 refs. Chicago, 7th March 1925. [Recd. May 1926.]

The known species of ricksettia include three pathogenic and 39 non-pathogenic micro-organisms found in various Arthropods. A superficial account is given if the non-pathogenic forms, and the pathogenic representatives are described with a view to proving that they are responsible for the diseases with which they are associated.

The author considers that the term " rickettsia " should be applied only to micro-organisms adapted to Arthropods and pathogenic to vertebrates and showing certain characteristics, which are described. Very little is known about the non-pathogenic, rickettsia-like, intracellular micro-organisms of Arthropods, whether casually present or in the rôle of symbionts. The work of the past on these lines has been superficial and evasive of the main problems concerning relationships between micro-organisms and hosts ; it has, however, served to obscure the status of the pathogenic species. The author regards as proved that *Dermacentroxenus rickettsi* is the cause of Rocky Mountain spotted fever, and that *Rickettsia prowazeki* is the cause of typhus. There is strong presumptive evidence that *R. pediculi* is the cause of trench fever.

PARKER (R. R.) & SPENCER (R. R.). **Rocky Mountain Spotted Fever : A Study of the Relationship between the Presence of Rickettsia-like Organisms in Tick Smears and the Infectiveness of the same Ticks.**—*Pub. Health Repts.*, xli, no. 11, pp. 461-469, 2 refs. Washington, D.C., 12th March 1926.

It has been repeatedly shown that hibernating adults of *Dermacentor venustus*, Banks (*andersoni*, Stiles) infected as larvae or nymphs on the same host will show a greater number of rickettsia associated with Rocky Mountain spotted fever [*Dermacentroxenus rickettsi*] and a higher percentage of infective individuals after feeding than without feeding. The observations described were made on wild ticks of unknown history as well as on reared infected individuals the history of which was known for at least one full generation in the laboratory. The latter were infected as larvae, and the resultant adults of the same generation were tested. The majority of ticks of both groups that showed the presence of rickettsia proved infective, though some of the

non-infective ticks contained rickettsia morphologically identical, and others proved infective though smears from them were entirely free from these organisms. A small proportion of wild ticks that were taken from a supposedly uninfected area contained similar rickettsia, but none caused infection in laboratory animals. It is difficult to account for the non-infective rickettsia that were present in part of the known infected, laboratory-reared ticks and exhibited a morphology identical with that of the rickettsia in fever-producing ticks of the same group. They may represent an non-virulent phase of the spotted fever virus. This agrees with previous observations showing the various degrees of virulence for guineapigs ranging from a non-infective or an immunising phase in unfed ticks to an active highly virulent phase following feeding [*R.A.E.*, B, xiii, 52].

COOPER (H.). **Tick-borne Diseases with some Remarks on the Diseases of Cattle caused by Protozoa.**—*Agric. Jl. India*, xxi, pt. 2, pp. 95–100, 1 fig. Calcutta, March 1926.

Piroplasma bigeminum is so widespread in India that in most localities cattle probably become infected as calves, when they are highly resistant, and they are subsequently immune. This immunity may, however, break down through the effects of intercurrent disease or exposure to other adverse conditions. The transmitting agent is *Boophilus* (*Margaropus*) *annulatus australis*, Fuller.

Experience indicates that all cattle in India are infected with *Theileria mutans* transmitted by *Hyalomma aegyptium*, L. The hypothesis that *T. mutans* is only a less virulent form of *T. parva* [*R.A.E.*, B, xiii, 17] is discussed. The results of *post mortem* examinations of lesions in animals in India reveal structures indistinguishable from those associated with African coast fever.

Apart from disease transmission, the presence of ticks on cattle inhibits growth and reduces the production of milk. Several formulae for arsenical dips are quoted [*R.A.E.*, B, iii, 20; vii, 13].

[PAVLOVSKIĬ (E. N.).] **Павловский (Е. Н.). Anti-tick Measures as a means of controlling Piroplasmosis. (Critical Review.)** [*In Russian.*]—Novgorodsk. Gubernsk. Zemel. Upravl. Veterinarnuiĭ Otdel, Prilozh. Material. Gubernsk. Konferentzii Zemel. Rabotn. Novgorode Dekabr' 1925. [Supplement to *Trans. Govt. Conference Agric. Workers Novgorod, December 1925*], 14 pp., 3 figs. Novgorod, 1926.

Ixodes ricinus, L., is the tick responsible for the transmission of piroplasmosis of cattle in Novgorod. The various methods adopted in the United States for the control of cattle-ticks, including the rotation of pasture and the use of arsenical dips, are discussed with a view to their application under local conditions.

DE BERGEVIN (E.). **Les Hémiptères suceurs de sang.**—*Arch. Inst. Pasteur Algérie*, iii, no. 1, pp. 28-44, 9 figs. Algiers, March 1925. [Recd. April 1926.]

A list is given of the Cimicid, Polyctenid and Reduviid bugs known to be blood-suckers, and of members of other families that have occasionally been recorded as attacking man. The latter include a Jassid, *Athysanus vulnerans*, sp. n., from Algeria.

Senevet (G.). **Description des nymphes de** *Rhipicephalus bursa* **et de** *Hyalomma lusitanicum* **avec un tableau pour la détermination des nymphes des Ixodidés algériens.**—*Arch. Inst. Pasteur Algérie*, iii, no. 1, pp. 59-63, 3 figs., 2 refs. Algiers, March 1925. [Recd. April 1926.]

The contents of this paper are indicated by its title.

Catanei (A.). **Nouveaux gîtes à** *Anopheles hispaniola* **en Algérie.**—*Arch. Inst. Pasteur Algérie*, iii, no. 2, pp. 138-139. Algiers, June 1925. [Recd. April 1926.]

In northern Algeria *Anopheles hispaniola*, Theo., usually breeds in the sandy pools of the mountain streams, where the only vegetation consists of green stringy algae. It has now been found in irrigation waters, either with or without larvae of *A. maculipennis*, Mg., but coinciding with similar algal growth.

Catanei (A.). **L'importance des gîtes à** *Anopheles* **constitués par les marelles qui se forment en été dans le lit des oueds d'Algérie.**—*Arch. Inst. Pasteur Algérie*, iii, no. 2, pp. 140-141, 2 refs. Algiers, 1925. [Recd. April 1926.]

The small pools left when the rivers have dried out during the summer in Algeria may become important breeding grounds for mosquitos. In such pools formed in the bed of a river near Algiers numbers of the larvae of *Anopheles maculipennis*, Mg., were found during August 1924.

Catanei (A.). **Remarques sur la destruction des larves de moustiques dans des gîtes artificiels par l'évacuation de l'eau.**—*Arch. Inst. Pasteur Algérie*, iii, no. 2, pp. 142-145. Algiers, June 1925. [Recd. April 1926.]

The resistance of mosquito larvae to desiccation varies according to the size of the larvae and the species; *Culex pipiens* is apparently more resistant in this respect than *Theobaldia longiareolata*. The removal of the water from containers acting as artificial breeding-places is not sufficient in itself to destroy all mosquito larvae, and they must themselves be removed by some mechanical means, such as washing them out with running water.

Cauvet (—). **Note sur les poissons susceptibles d'être utilisés dans la lutte contre le paludisme en dévorant les larves de moustiques.**—*Arch. Inst. Pasteur Algérie*, iii, no. 2, pp. 146-154, 6 figs. Algiers, June 1925. [Recd. April 1926.]

A short description is given of the various fish that might be used in Algeria for the destruction of mosquito larvae. The species dealt with include *Phoxinellus chaignoni*, which will live in an aquarium even in the summer; *Tellia apoda*, particularly adapted to live in small shallow pools, where it devours all the animalculae it finds; *Cyprinodon iberus*, which will live in an aquarium and is able to withstand great variations in temperature; and *C. fasciatus*, which is widely distributed and occurs in more or less brackish waters.

SERGENT (Et.). **Quelques parasites des Culicides.**—*Arch. Inst. Pasteur Algérie*, iii, no. 2, pp. 155-168, 12 figs., 15 refs. Algiers, June 1925. [Recd. April 1926.]

A list of parasites recorded from mosquitos in Algeria and Corsica is given, including various spirochaetes, *Plasmodium* spp. and other Protozoa, mites, etc. *Herpetomonas algeriense*, sp. n., is recorded from *Culex pipiens*, L., and *Aëdes argenteus*, Poir. (*Stegomyia fasciata*, F.) bred from larvae in the laboratory and fed on owls harbouring *Trypanosoma noctuae* and *Haemamoeba ziemanni*. *Plasmodium relictum* was recovered from *Culex pipiens* fed on infected canaries, the sporozoites having penetrated to the interior of the Malpighian glands. Its development is described and compared with previous records.

SERGENT (Et.). **Comment recueillir les *Anopheles*; larves, nymphes et adultes.**—*Arch. Inst. Pasteur Algérie*, iii, no. 2, pp. 169-175, 10 figs. Algiers, June 1925. [Recd. April 1926.]

Instructions are given for collecting and transporting the larvae, pupae and adults of Anophelines, and the apparatus required is described.

SERGENT (Ed. & Et.), PARROT (L.)., FOLEY (L.). & CATANEI (A.). **L'hydraulique et le paludisme.**—*Arch. Inst. Pasteur Algérie*, iii, no. 2, pp. 205-213. Algiers, June 1925. [Recd. April 1926.]

A short account is given of the biology of Anophelines in the countries bordering on the Mediterranean, the object of the paper being to point out the effect of irrigation on the incidence of malaria, and to show how by judicious treatment of waterways and containers the danger to the public health may be reduced.

Monographies des localités dénoncées comme palustres en Algérie. Etude épidémiologique et prophylactique du paludisme en 1923-24-25.—*Arch. Inst. Pasteur Algérie*, iii, no. 3, pp. 227-290, numerous figs. Algiers, September 1925. [Recd. April 1926.]

A brief account is given of conditions with regard to malaria in each of the districts dealt with, and measures against mosquito larvae suitable for each situation are suggested.

SENEVET (G.) & ROSSI (P.). **Note sur deux Ixodidés, parasites accidentels de l'homme.**—*Arch. Inst. Pasteur Algérie*, iii, no. 3, p. 298. Algiers, September, 1925. [Recd. April 1926.]

In the course of studying ticks on Algerian cattle, the authors found themselves attacked by *Rhipicephalus bursa*, C. & F., and *Hyalomma lusitanicum*, Koch.

BLANCHARD (—) & LAIGRET (—). **Modifications survenues depuis 1908 dans la distribution de la maladie du sommeil en Afrique équatoriale française et situation actuelle.**—*Ann. Méd. & Pharm. coloniales*, xxiv, no. 1, pp. 67-76. Paris, January-March 1926.

The local distribution of sleeping sickness in French Equatorial Africa since 1908 is discussed. The suppression of the disease depends

mainly on the treatment of infected persons. All carriers of the infection should be determined by all available means, and until they have been cured their movements should be strictly controlled.

Juillet (A.) & Diacono (H.). **Essai de destruction du pou de corps ou de vêtement** (*Pediculus corporis* **de Geer**) **par les émulsions savonneuses d'oléo-résine de pyrèthre de Dalmatie** (**Chrysantème insecticide**).—*Minist. Commerce & Indust., Office national Matières premières*, notice no 20. (Abstract in *Ann. Méd. & Pharm. coloniales*, xxiv, no. 1, pp. 100-101. Paris, January-March 1926.)

Pyrethrum soap solution applied in the correct dosage is an effective and practical means of destroying *Pediculus humanus*, L. (*corporis*, DeG.), and is absolutely innocuous to man. In order to ensure the destruction of the lice and their eggs, contact must be maintained for 20 minutes.

Rodhain (J.). **Existence d'un foyer de Glossines du groupe** *morsitans* **dans le Bas-Ouellé.**—*Bull. Soc. Path. exot.*, xix, no. 3, pp. 197-198. Paris, 1926.

The author, in 1916, recorded the presence of *Glossina morsitans* in the north-east of the Belgian Congo [*R.A.E.*, B, iv, 56] and thought that he had then defined the western limit of the species in that latitude. A female of this species, or of the *morsitans* group, has, however, been found recently between the 4th and 5th degree of north latitude and near to the 25th parallel east longitude, this being considerably further west in the northern Belgian Congo than any previous records.

Escomel (E.). **Un nouveau Pseudo-méloïde, insecte médicinal du Pérou.**—*Bull. Soc. Path. exot.*, xix, no. 3, pp. 198-201. Paris, 1926.

A number of beetles of the genus *Pseudomeloë* have been known in Peru since very early times and were used by the Incas as vesicants [*R.A.E.*, B, xii, 17]. A list of the known ones is given, and *P. cockerelli*, sp. n., is described from Arequipa. The beetles appear in late winter.

Rodhain (J.). **Le recul de la Tsétsé :** *Glossina morsitans*, **devant l'occupation européenne au Katanga.**—*Bull. Soc. Path. exot.*, xix, no. 3, pp. 222-235, 1 map. Paris, 1926.

In the course of a journey through Katanga in 1925, the author revisited several regions in which, in 1910-1912, he had studied the distribution of *Glossina*. He found that there had been a distinct retrogression of *G. morsitans*, which, however, was unequal in the different regions. At Elisabethville, where the country stands high and is relatively dry, the fly has retreated considerably further than the extent of the recent settlements or of the deforested areas. This retreat corresponds with that of the big game in the district. In lower and more humid regions the retrogression is less, corresponding pretty closely with the occupied and deforested areas. Where the retreat of the fly has been least, it is noticeable that the big game has not entirely disappeared, the long grasses of the neighbouring savannah offering

sufficient shelter in certain seasons. Generally speaking, *G. morsitans* has also considerably diminished in numbers through the navigable portions of the Bouhama-Kabalo canal.

In contradistinction to this retrogression of *G. morsitans*, *G. palpalis* has scarcely modified the extent of its occurrence at all.

E. Roubaud, commenting on this paper, remarks that throughout French West Africa, colonisation and settlement in a region formerly inhabited by *G. morsitans* always results in more or less complete disappearance of the fly, but he considers that the greatest factor in this disappearance is the retreat of the big game that always follows on man's incursion. In Dahomey this is particularly noticeable. Moreover, *G. morsitans* never appears able to adapt itself to man in the absence of other hosts as *G. palpalis* does ; at the most the fly may, in favourable seasons, accompany domestic animals or man to the edge of cultivated lands, but permanent colonies are never found in the strict vicinity of villages. Doubtless the biological data of this sort recorded by English observers in East Africa, which seem to be closely related to the endemic occurrence of sleeping sickness due to *Trypanosoma rhodesiense* in that part of Africa, concern physiological races or varieties of *G. morsitans* different from those known in the West.

BRAU (—). **Récentes manifestations de fièvre jaune en Afrique occidentale française.**—*Bull. Soc. Path. exot.*, xix, no. 3, 237-244. Paris, 1926.

Since the epidemics of 1906, yellow fever has become extremely rare in French West Africa. In 1922 and the following years, however, sporadic outbreaks, apparently without any relation to each other, have occurred in three of the French Colonies as well as in Nigeria and, during 1925, in Liberia [*R.A.E.*, B, xiv, 23]. The necessity for stringent measures against *Aëdes argenteus*, Poir. (*Stegomyia calopus*, Mg.) is therefore obvious. The anti-larval service does a good deal in the way of keeping down mosquito larvae, but it is pointed out that the oiling of large areas of water is not so important in the circumstances as the inspection of odd collections of water in old tins, etc., in the vicinity of suspected houses. Wherever a possible case of the fever has occurred, the house should be thoroughly searched for mosquitos and disinfected.

WHEATLAND (F. T.). **A Fever resembling a Mild Form of Typhus Fever.**—*Med. Jl. Australia*, 13th Year, i, no. 10, pp. 261-266, 12 refs. Sydney, 6th March 1926.

A number of cases are described from Toowoomba, Australia, closely resembling typhus fever except that no lice were present, The great majority of the cases came from the country districts, where mice are very prevalent, and it is thought that the disease may be transmitted by some ectoparasite associated with these rodents.

HILL (G. F.). **The Buffalo-fly in North Australia.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, i, pp. 409-411. Melbourne [1926].

A short account is given of *Lyperosia exigua*, de Meij. (buffalo fly) and its distribution [*R.A.E.*, B, vi, 118 ; xii, 138]. Under laboratory

conditions the life-cycle from egg to adult occupies from 120 to 208 hours, though under natural conditions it is probably shorter in the summer and longer in the winter. There is no evidence that the winter is spent in the larval or pupal stages. The early broods are probably the progeny of flies that emerged late in the previous summer.

The fly exists in New Guinea and New Britain, but not in Papua, where it is suggested that a close supervision should be kept of stock from infested localities.

CARTER (H. R.). **The Chance of the Extension of Yellow Fever to Asia and Australasia.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, ii, pp. 1377-1388, 10 refs. Melbourne [1926].

There are large areas of the world, particularly in Australia and south-eastern Asia, in which the conditions, including the presence of *Aëdes* (*Stegomyia*) *argenteus*, Poir. (*aegypti*, L.), and of susceptible populations, are favourable for the occurrence of yellow fever, but in which it is not present. Moreover, although it is almost certain that *A. argenteus* is the only vector of yellow fever in America, it is possible that there are other actual or potential vectors of the same subgenus elsewhere. If yellow fever were once introduced into south-eastern Asia, it would almost certainly become endemic, and the effects would be calamitous, although it would probably be controlled, if it occurred, in Australia and certain other countries.

Men boarding ships at a port where yellow fever occurs are not a direct source of danger to any part of Asia or Australia, as the voyage from the nearest such port is considerably longer than the longest time that a man may remain infective to *A. argenteus* ($9\frac{1}{2}$ days); the danger is due to the presence of *A. argenteus* on the ships, infected either before or during the voyage. The only regions in which yellow fever now exists are tropical America and West Africa. The three foci of the disease in America are the northern coast of Brazil, Colombia and perhaps adjacent countries, and Mexico and Central America; the first two of these are of no direct importance to Australia and Asia, owing to the quarantine restrictions in the Panama Canal and the distance round Cape Horn, and at the present time there is no yellow fever in the Pacific Coast ports of Central America and Mexico, while in any case the amount of traffic between these and Asia and Australia is slight.

The possibility of the eradication of yellow fever from West Africa is apparently small, and the author considers that when railway communication is opened up across Africa the disease will almost inevitably spread to the lowlands of East Africa, which are infested with *A. argenteus*. If yellow fever became general in East Africa, the danger of its being carried thence to Asia would be great.

FERGUSON (E. W.). **The Distribution of Insects capable of carrying Disease in Eastern Australia.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, ii, pp. 1477-1486. Melbourne [1926].

Much of this paper has already been noticed from a summary [*R.A.E.* B, xii, 4]. In discussing the TABANIDAE, which extend from New Guinea eastwards through the Solomon Islands and New Hebrides to New Caledonia, and occur also in Samoa and Fiji, but not in Hawaii, the author states that they are believed to have been responsible for

the transmission of anthrax in an outbreak that occurred in New Caledonia (not New Zealand as stated in the above-mentioned summary) and also for the transmission of surra in an outbreak that occurred in Western Australia.

Anopheline mosquitos extend eastward from New Guinea through the Solomon Islands to the New Hebrides, but have not been recorded from New Caledonia, Fiji, or the Polynesian islands. Among the Culicines, *Aëdes argenteus*, Poir., is recorded from New Guinea, New Caledonia, Fiji, and Samoa. *Taeniorhynchus* (*Mansonioides*) *africanus*, Theo., occurs in North Queensland, and *T.* (*M.*) *uniformis*, Theo., along the eastern coast of Queensland into New South Wales ; one of these two species has been found to transmit *Filaria bancrofti* in Africa, but it is doubtful whether they are implicated in its transmission in Australia. Other mosquitos occurring in the Australian region in which partial development of *F. bancrofti* has been observed are *Aëdes albopictus*, Skuse, *A. argenteus*, *Culex sitiens*, Wied., *C. bitaeniorhynchus*, Giles, and *Anopheles annulipes*, Wlk., while negative results have been obtained with *Mucidus alternans*, Westw., *Aëdes notoscriptus*, Skuse, and *A. vigilax*, Skuse.

Stomoxys calcitrans, L., is widely distributed in Australia and occurs far inland in New South Wales. *Lyperosia exigua*, de Meij., occurs in North Australia and the Solomon Islands. *Hippobosca camelina*, Leach, has been introduced into Western Australia, and *H. equina*, L., is common in New Caledonia. The non-blood-sucking Muscoid and Oestrid flies are also discussed.

Bed-bugs are probably distributed throughout Australia ; *Cimex lectularius*, L., is common in many towns of Queensland and New South Wales, particularly on the coastal belt., and *C. hemiptera*, F. (*rotundatus*, Sign.) occurs in Samoa, having been introduced by the Chinese. Bed-bugs are unknown at Raratonga. The lice, *Phthirus* (*Phthirius*) *pubis*, L., *Pediculus humanus*, L. (*corporis*, DeG.), and *P. capitis*, DeG., occur throughout Australia, but no louse-borne disease has been introduced.

DODD (S.). **The Piroplasmoses of the Pacific Regions.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, ii, pp. 1502-1512. Melbourne [1926].

In this paper the author reviews the present state of knowledge concerning the piroplasms of cattle and other animals in all the countries bordering on the Pacific, mentioning incidentally the occurrence of ticks responsible for their transmission.

SANDERSON (C.J.). **Control of the Cattle Tick in New South Wales.**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, ii, pp. 1525-1532, 2 refs. Melbourne [1926].

The bulk of the information on *Boophilus annulatus australis*, Fuller, contained in this paper has already been noticed from other sources [*R.A.E.*, B, ix, 10 ; xi, 68, 104].

JOHNSTON (T. H.). **Observations regarding the Non-parasitic Stages of the Queensland Cattle Tick. (Abstract.)**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, ii, p. 1541. Melbourne [1926].

The minimum incubation period for the eggs of the cattle tick [*Boophilus annulatus australis*, Fuller] in Queensland is from 17 to 20

days in mid-summer, while the normal time is about 30 days in summer and from 2½ to 3 months in winter. Both hot, dry weather and very cold weather retard or even prevent egg development. This indicates the maximum time during which tick-free cattle may be kept on originally tick-free pasture through which tick-infested cattle have passed, without danger of becoming infested. The maximum time between the dropping of an engorged female tick and the death from starvation of all larvae hatching from eggs laid by it rarely extends to 6 months, and is usually much less. Consequently if all cattle, horses, and sheep (on which seed ticks very rarely develop to maturity) are kept from tick-infested pasture for 4 or 5 months in the summer and or for 6 months during the rest of the year, there is no danger of tick-free cattle becoming infested in it at the end of these periods, and a six-monthly rotation of pastures would render them free from ticks, provided the seed ticks were not carried to them by flood water or other agencies. In New South Wales the periods are very much longer.

HARRISON (L.). **Ectoparasitic Insects and Pacific Problems. (Abstract.)**—*Proc. Pan-Pacific Sci. Congress, Australia, 1923*, ii, pp. 1584-1585. Melbourne [1926].

The author considers, in the light of recent researches, that the Anoplura (sucking lice) are modified Mallophaga, more nearly related to the sub-order Ischnocera of that order than to the sub-order Amblycera, and that they all have probably been derived from wingless Psocoptera. Lice have a host distribution, not a zoo-geographical one, and have followed the evolution of their host-groups, but have themselves, owing to uniform environmental conditions, not differentiated at so rapid a rate. The study of the Mallophaga on various hosts thus often throws valuable light on the relationships of the latter, and on lines of migration; especially is this true of the Ischnocera, which do not leave the body of their host on its death.

BUXTON (P. A.). **The Depopulation of the New Hebrides and other Parts of Melanesia.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xix, no. 8, pp. 420-454, 15 refs. London, April 1926.

Malaria and yaws are the two most important of the endemic diseases in the New Hebrides, though there are many other factors that affect the question of depopulation. Malaria is most prevalent during the hot and rainy season, roughly from December to April. *Anopheles punctulatus*, the only species of the genus known from the New Hebrides, breeds in swamps and stagnant surface water, and as the soil is very porous nearly everywhere, abundant breeding-places exist only during the season of constant heavy rain. The early stages were never found in tree-holes, a fact that it is difficult to reconcile with the presence of malaria in certain places quite devoid of surface water. Examinations in the dry season showed that benign tertian is slightly more common than malignant tertian, but it is probable that the latter is really the chief cause of malaria in these islands. Quartan malaria was not found at all. In the New Hebrides malaria apparently occurs in all the islands except Futuna, and these are the most southerly and easterly Pacific islands to which the disease has penetrated.

SCHAPIRA (L.). **Zur Endemie des Papatacifiebers in Haifa.** [The Endemicity of Sandfly Fever in Haifa.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxx, no. 5, pp. 196-205, 8 refs. Leipzig, 1st May 1926.

Sandfly fever in Haifa is at its height in June and August, corresponding to the two summer generations of *Phlebotomus*. The hibernated larvae pupate, and the adults emerge and oviposit soon after the beginning of the hot summer weather in June. This generation is short-lived and disappears in the middle of summer.

HASSELMANN (C. M.). **Beitrag zur Frage des Anophelismus in Jugoslavien.** [A Contribution to the Question of Anophelism in Jugoslavia.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxx, no. 5, pp. 205-207, 7 refs. Leipzig, 1st May 1926.

A collection of mosquitos from Dalmatia included 492 *Anopheles maculipennis*, 64 *A. elutus*, 6 *A. bifurcatus*, 3 *A. algeriensis* and 50 *Culex pipiens*. *A. maculipennis* and *A. elutus* were found difficult to distinguish ; the latter is far commoner in the south of Dalmatia than in the north.

HERMS (W. B.). **The Effects of Parasitism on the Host and on the Parasite.**—*Jl. Econ. Ent.*, xix, no. 2, pp. 316-325, 14 refs. Geneva, N.Y., April 1926.

Many of the more dangerous blood-sucking insects have a relatively painless bite, an example being the bite of *Anopheles maculipennis*, an important vector of malaria, compared with that of *Aëdes dorsalis*. For a blood-sucking insect to be a successful carrier of human disease, its attack must necessarily be comparatively inoffensive to its host.

MARTINI (E.). **Ueber die Stechmücken der Umgebung von Saratow.** [On the Mosquitos of the Environs of Saratov.]—*Arb. biol. Wolga-Sta.*, viii, no. 4-5, pp. 189-228, 5 figs. Saratov, 1926. (With a Summary in Russian.)

In all 27 mosquitos are recorded from south-eastern Russia, most of them being found in the environs of Saratov. These include *Aëdes behningi*, sp. n., *A. duplex*, sp. n., and *A. subdiversus*, sp. n. Keys are given to the adults and larvae.

DAVIS (N. C.). **Notes on the Female Hypopygia of Anopheline Mosquitoes, with special Reference to some Brazilian Species.**—*Amer. Jl. Hyg.*, vi, March Suppt., pp. 1-22, 38 figs., 11 refs. Baltimore, Md., 1926.

The use of male characters for the classification of Anophelines is unsatisfactory, as the majority of adults captured are females, and it is very difficult to find and breed out the larvae of rare species. The female genitalia of Anophelines have, however, a striking resemblance to one another, though there are sufficient differences to group the species found within a given area. These characters are found in the eighth sclerites, ninth and tenth tergites, insula, atrial plates, postgenital plate, cowl and cerci. The Brazilian Anophelines are divided into groups on this basis.

Davis (N. C.). **Study on the Dispersion of Resting Anopheline Mosquitoes from Dwellings in Brazil.**—*Amer. Jl. Hyg.*, vi, March Suppt., pp. 23-35, 9 refs. Baltimore, Md., 1926.

Previous work on the destruction of adult mosquitos, particularly by weekly fumigation of dwellings, is reviewed. In the author's opinion the value of occasional destruction of adult Anophelines, during the active mosquito season, will depend largely on the habits of the species in question. A series of experiments was undertaken to determine the permanence within doors of the Anophelines found in dwellings in certain towns of the coastal lowlands, State of Rio de Janeiro, Brazil. Ninety per cent. of these were *Anopheles argyritarsis*, R.-D., which never rests indoors in such large numbers as have been recorded for *A. maculipennis*, Mg., or *A. quadrimaculatus*, Say. The results show that only 3·1 per cent. of the Anophelines resting in certain houses on given days in warm weather were present in the houses on the days immediately following. There is no means of knowing what proportion of the mosquitos that secure a blood meal afterwards remain in the houses. It appears doubtful whether a maximum destruction by weekly fumigation of 3 per cent. of those remaining after feeding on 6 nights during the week, plus 100 per cent. of those remaining after the 7th night, would have any marked effect on malaria transmission within a given house.

Johnson (H. A.). **Occurrence of *Anopheles vestitipennis* in Porto Rico.**—*Amer. Jl. Trop. Med.*, vi, no. 2, pp. 153-155. Baltimore, Md., March 1926.

As a result of investigations made in Porto Rico in 1924 and part of 1925 the larvae of *Anopheles vestitipennis*, D. & K., were found in a stagnant ditch filled with vegetation in a sugar-cane field. They increased in abundance from October to January, but by the middle of February had decreased again so that only scattered larvae could be found. This is apparently the first record of the larva and adult male. This mosquito readily attacks man in captivity, but its rôle as a vector of malaria has not been proved.

Boyd (M. F.). **The Influence of Obstacles unconsciously erected against Anophelines (Housing and Screening) upon the Incidence of Malaria.**—*Amer. Jl. Trop. Med.*, vi, no. 2, pp. 157-160. Baltimore, Md., March 1926.

Contrary to the opinion frequently heard that no screening is better than poor screening, the results of the observations in Missouri here described justify the conclusion that a definite relation exists between the incidence of malaria and the accessibility of a population to mosquitos, and that anything that makes it more difficult for mosquitos to enter a dwelling increases the protection of its occupants.

In the area surveyed none of the dwellings met the requirements of so-called mosquito proofing; but in those screened as a measure of protection against flies (coarse mesh, 12-14), a certain amount of protection against Anophelines was afforded, as estimated from malaria incidence.

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WALCH (E. W.). **Over de Malaria in het Zuiden der Vereenigde Staten van Noord-America.** [On Malaria in the South of the United States of North America.]—*Geneesk. Tijdschr. Ned.- Indië*, lxvi, no. 1, pp. 112-114. Batavia, 1926.

This is a brief review of the position as regards malaria in the southern United States.

FREEBORN (S. B.). **The Mosquitoes of California.**—*Univ. California Pubns. Ent.*, iii, no. 5, pp. 333-360, 41 figs., 30 refs. Berkeley, Cal., 24th March 1926.

The mosquitos of California are divided into the salt-marsh breeders that are pests along the coastal area ; the mountain breeding species of *Aëdes* that are troublesome at the higher elevations ; and the Anophelines, which are responsible for the endemic foci of malaria in some parts of the central valley.

The distribution is given in general terms except for the rarer species. As a large series of both larvae and adults have been studied, it has been possible to point out the variable characters that have been the cause of much confusion and consequent creation of synonyms. Keys are given to the genera, subgenera and species.

The ecological data have been collected over a period of 9 years, three summers being devoted exclusively to this work.

It is considered that the difficulties of the mechanics of mosquito control have been over-emphasised, and that they are no more difficult than corresponding agricultural drainage projects, except that they require more attention to detail, while their efficient application depends on an accurate knowledge of the taxonomy of the group and the ecology of the species involved.

FOWLER (C. E. P.). **Malaria in Palestine. A Summary of Anti-malarial Work carried out with the 54th Division in the Mulebbis Area, April to June 1918.**—*Jl. R.A.M.C.*, xlvi, no. 4, pp. 241-248. London, April 1926.

This paper describes antimalarial measures under war conditions in which rivers were cleared, graded and channelled, wells and cisterns were oiled, and a marsh was drained and oiled. The work was very costly, but about 2,000 men were infected with malaria and incapacitated for some length of time, and if no measures had been taken the whole force would have melted away, as was the fate of a large part of the Turkish forces placed in similar positions.

The Anophelines found were *Anopheles mauritianus* and *A. superpictus*, common in May and June, *A. maculipennis* and *A. hyrcanus*, common in June, and *A. algeriensis*, all of which were bred from larvae in natural waters ; and *A. bifurcatus*, found in the earlier part of the year in wells and cisterns.

MORISHITA (K.) **Experimental Observations on the Habits of *Culex fatigans* with Special Reference to the Influence of Hydrogen-ion Concentration upon its Development.** [*In Japanese.*]—*Jl. Med. Soc. Formosa*, no. 247, 37 pp. Taihoku, Formosa, 1925. (With a Summary in English.) [Recd. May 1926.]

Near Taihoku city, the hydrogen-ion concentration of the breeding-places of *Culex fatigans*, Wied. (*quinquefasciatus*, Say) is between

pH 6·5 and 7·6. In a given place it does not alter so greatly as to affect the fauna in a short period. The egg and egg raft of *C. fatigans* are described. Soon after deposition the egg is a greyish white, but changes into greyish brown in about 2 hours. It is not known whether the change of colour is due to an oxidation process, although by placing the eggs in pure hydrogen gas the author was able to prevent the change of colour for 3 days; those that had already changed in colour did not return to the original colour when treated with reducing agents.

Oviposition usually takes place in darkness, or when the mosquitos are exposed to alternating light and darkness, but very rarely in continuous light. The egg period varies with the temperature, lasting 3 days at 16-22° C. [60·8-71·6° F.], and one day at 25-30·5° C. [77-86·9° F.] All the eggs composing a raft hatch at about the same time. The hatching capacity of eggs subjected to desiccation remains unchanged for 3 days, but it becomes impaired after 4; and after 5 the eggs lose their viability. Exposure to direct sunshine, 37°C. [98·6° F.], for more than 50 minutes kills all the eggs. They retain their ability to hatch until the temperature of the water rises to 40° C. [104°F.]. In moist conditions they can resist for one day such low temperatures as from + 2 to — 2° C. [35·6-28·4° F.].

Between pH 2·0 and 9·8 the hatching of the eggs takes place normally, although in a water of pH 2·0 the newly hatched larvae die soon afterwards. It is therefore concluded that the hatching itself is not influenced by the hydrogen-ion concentration of the water. Between pH 5·7 and 7·6 the newly hatched larvae survive a week, even without food, and in this period this mosquito can nearly complete its aquatic life, if food is available and other conditions are favourable. Between pH 5·3 and 9·4, when food is present, growth and metamorphosis proceed at almost the same rate, and there is no special preference for either acid or alkaline waters. It is therefore concluded that in the case of *C. fatigans* the hydrogen-ion concentration of the environment is of little importance as a factor in development.

The incubation period of the older eggs is only slightly influenced by the temperature, but that of the younger is greatly affected. Hatching, pupation, and adult emergence occur normally in light as well as in darkness. The pupal period varies with the temperature, and is much prolonged even at 9° C. [48·2° F.] The males emerge in advance of the females.

Morishita (K.). **Mosquitos and Dengue.** [*In Japanese.*]—*Jl. Med. Soc. Formosa,* no. 247, 15 pp. Taihoku, Formosa, 1925. [Recd. May 1926.]

The literature on the relation of mosquitos to dengue is reviewed in detail.

Sugimoto (M.). **Catalogue of Parasites of Domestic Animals in Formosa.** [*In Japanese.*]—*Dept. Agric., Res. Inst.* Taihoku, Formosa, 1925.

A list is given of certain insect parasites of domestic animals in Formosa.

WHIPPLE (F. R.). **Parasitic and non-parasitic Diseases of the Ears in the Canine and Feline.**—*Jl. Amer. Vet. Med. Assoc.*, lxix (N.S. xxii), no. 2, pp. 148–156. Detroit, Mich., May 1926.

Among the parasites occurring in the United States that are briefly dealt with are *Sarcoptes scabiei canis*, Gerlach, of the dog; *Notoedrus* (*Notoedres*) *cati*, Hering, of the cat, and transmissible also to dogs; *Otodectes cynotis*, Hering, of the dog; *O. cynotis* var. *cati*, Hering, of the cat; and *Ornithodorus megnini*, Dugès (spinose ear tick), which attacks cattle, horses, dogs and sheep, and sometimes man. Several formulae for solutions and ointments for use against parasites attacking the ears of cats and dogs are given.

MILLER (W. C.). **Some Parasites of British Sheep, with some Suggestions for their Eradication and Control.**—12mo, 106 pp., 16 pls., 3 figs. Glasgow, Robert Young & Co., Ltd., 1925. Price 2*s.* 6*d.* net. [Recd. June 1926.]

This book is intended primarily for the use of practical sheep farmers. In the introduction the author briefly defines the meaning of parasitism, enumerates the ways in which parasites are injurious to sheep, and tabulates the differences between the insect and Arachnid parasites of sheep. The remainder of the book is divided into four sections. The first and second deal respectively with insect and Arachnid parasites; these are treated either individually or in appropriate groups, and their life-histories, the damage that they cause, and methods of treatment and control are described; the third section deals with certain diseases of sheep; and the last with dipping.

ROE (R. J.). **The Horse Bot-fly, the Ox Warble-fly, and the Sheep Nostril-fly.**—*Cyprus Agric. Jl.*, xxi, pt. 2, pp. 52–55. Nicosia, April 1926.

An account is given of three common parasites of domestic animals in Cyprus, namely, *Oestrus* (*Gastrophilus*), infesting horses and donkeys, attacks of which may be prevented by examining the animals at least every second or third day and destroying any eggs observed on the hairs by singeing them or wiping them lightly with a cloth soaked in kerosene or petrol; *Hypoderma* (ox warble-fly), for which, besides the squeezing out method, a dressing is recommended composed of 1½ lb. fresh lime, 4 lb. tobacco powder and 1 gal. water, which should be stood for 24 hours and then strained and applied with a sponge; and *Cephalomyia* (*Oestrus*) *ovis*, L. (sheep nostril fly), for which the remedies are described [*R.A.E.*, B, ix, 183].

COCKAYNE (A. H.). **Entomology.**—*New Zealand Dept. Agric., Ann. Rept. 1923–24*, p. 23. Wellington, 1924. [Recd. May 1926.]

The position in regard to sheep maggot flies has not materially altered, though the parasites liberated for their control have become established, so that results may be expected in due course.

Sinclair (J. M.). **Southern Rhodesia : Report of the Chief Veterinary Surgeon for the Year 1925.** Fol. 4 pp. Salisbury, Rhodesia, 1926.

The brown tick [*Rhipicephalus appendiculatus*, Neum.], which is chiefly responsible for the transmission of African Coast fever in Southern Rhodesia, spends a very short time on its host as a larva or as a nymph, only from three to five days being passed on the host in each of these stages ; it therefore follows that dipping cattle at seven-day intervals cannot destroy all larvae and nymphs of this tick. If carried out in properly constructed and managed tanks, dipping will, however, in the course of two or three years reduce ticks to what may be termed an irreducible minimum ; irreducible because *R. appendiculatus* breeds on game, etc., and cannot be entirely eradicated. The author considers that irregular and improper dipping has been the cause of the recent heavy infestation by *R. appendiculatus* in Southern Rhodesia, not weather conditions or the absence of veldt fires, as has been suggested.

Bevan (Ll. E. W.). **Southern Rhodesia : Report of the Director of Veterinary Research for the Year 1925.** Fol. 9 pp. Salisbury, Rhodesia, 1926.

Flies bred from larvae (so-called screw-worms) causing myiasis in cattle were all identified as *Chrysomyia bezziana*, Vill., while others bred from larvae removed from decomposing carcases included *Chrysomyia albiceps*, Wied. (*putoria*, Wied.), *C. chloropyga*, Wied., *Lucilia fucina*, Wlk., *Musca humilis*, Wied., and *M. domestica*, L. It appears, therefore, that the use of poisoned baits may not be of any value in controlling the species that attacks cattle, *C. bezziana*, and other methods will have to be devised.

Jack (R. W.). **Cattle Myiasis : "Screw-Worm."**—*Rhodesia Agric. Jl.*, xxiii, no. 5, pp. 422–424 ; also [*S. Rhodesia* :] *Minist. Agric. & Lands*, Bull. 593, pp. 9–11. Salisbury, May 1926.

Chrysomyia bezziana, Vill., is responsible for the "screw-worm" disease of cattle in Southern Rhodesia. As it appears to be incapable of breeding in carcases, domestic animals are likely to be the main source of infestation. They should be treated by the removal of the maggots and the dressing of wounds. The larvae may be killed in a container of water covered with a film of paraffin.

Hirst (S.). **Preliminary Note on a New Species of Tick of the Genus *Dermacentor* from Mount Everest.**—*Ann. & Mag. Nat. Hist.*, (9) xvii, no. 102, p. 671. London, June 1926.

Dermacentor everestianus, sp. n., is described from Tibet.

Lawson (P. B.). **Some "Biting" Leafhoppers.**—*Ann. Ent. Soc. Amer.*, xix, no. 1, pp. 73–74. Columbus, Ohio, March 1926.

In reviewing various records of Jassids attacking man, it is suggested that in view of the persistence of these insects it may be possible that they are in search of blood. The following were taken biting the author when collecting at a light : *Deltocephalus inimicus*, Say, *Draeculacephala mollipes*, Say, and *Euscelis obscurinervis*, Stål.

Blake (E. G.). **The Protection of Buildings against Vermin, with a comprehensive Description of the most effective Methods that can be adopted for the Extermination of Rats, Mice and various Insects.**—8vo, x+85 pp., 4 figs. London, Crosby Lockwood & Son, 1926. Price 2*s.* net.

More than half of this book is devoted to methods of destroying rats, both in buildings and on ships, and to means of preventing their access to buildings; various proprietary and other rat poisons and a number of fumigants and methods of applying them are discussed. The last chapter deals with the destruction of cockroaches, ants and house-flies in houses. The information is of a practical nature, and assumes no technical knowledge of the subject.

Schuurmans Stekhoven, Jr. (J. H.). **The Bloodsucking Arthropods of the Dutch East Indian Archipelago. VII. The Tabanids of the Dutch East Indian Archipelago.**—*Treubia*, vi, suppmt., 551 pp., 287 figs., 18 pls. Buitenzorg, April 1926.

This is a monograph of the Tabanids occurring in the Dutch East Indian Archipelago, and also includes those of some neighbouring countries. Keys are given to the subfamilies, genera and species. The habitats are recorded, and the geographical distribution of each species is given, with lists of those of each genus recorded in the various countries.

The new species dealt with are: From New Guinea, *Silvius latistriatus, S. atriventer, S. atripes, S. variegatus, S. atratus, Erephopsis albibarbus, Tabanus griseiventer, T. selene, T. latisegmentatus, T. albidosegmentatus, T. ochrothorax, T. sol, T. olivaceus, T. opalescens, T. intempestivus, T. flammeus, T. angusticallosus, T. luciliaeformis* and *T. bipunctatus*; from China, *T. fenestratus, T. longibasalis* and *T. flavimarginatus*; from the Federated Malay States, *Gastroxides aterrimus, G. fuscus, Haematopota splendens*, and *Tabanus effilatus* (also from Sumatra and Madoera Is.); from Burma, *T. burmanense*; from India, *T. avittatus, T. flavimedius, T. laticinctus, T. bombayensis, T. imparicallosus, T. pallidiventer, T. flavipus, T. griseifacies* (also from Ceylon), *T. noctuinus* and *T. latifrons*; from Ceylon, *T. inflatipalpis*; from Sumatra, *H. truncata, T. brunnipes, T. flavistriatus, T. fusciventer, T. multicinctus* and *T. flavicornis* on horse, cattle and buffalo, *H. confluens, T. atripilosus, T. oviventris* and *T. bubalophilus* on buffalo, *T. flaviscutellatus, T. bilateralis*, and *T. albitriangularis* (also from the Malay States) on horse and buffalo, *T. pseudorufiventris* on cattle and horse, *T. fontinalis, T. citripilosus, T. canipus, T. aurilineatus* (also from the Malay States), *T. gilvus, T. flavitibiatus, T. paralleliventer, T. ochroater, T. angustistriatus, T. auricingulatus, T. fuscithorax, T. ingens, T. brunniventer, T. flavitriangularis, T. griseithorax, H. intermedia, H. equitibiata, H. nigricans, H. annulipes, H. nigrita, H. atriventer, H. mediatrifrons* and *H. irrorata*, Macq., subsp. *cristata*, n.; from Java, *H. ensifer, H. paucipunctata*, and *T. auribundus* on horse, *H. fumigata* on cattle, *T. albivittatus* and *T. flavivittatus* on horse and cattle, *T. atripunctatus* on horse and buffalo, *T. chloropis, T. tricoloratus, T. albopunctatus, T. angustiventer, T. aurisparsus, T. longicornis, T. fuscibarbus, H. elegans* and *H. jacobsoni*; from Java and Sumatra, *T. griseipalpis* on horse (also from Siam), *T. angustitriangularis* on buffalo, *T. rufiscutellatus* on cattle and buffalo, *T. chrysater* and *T. albicintus*; from Borneo, *T. latifascies, T. parallelifrons* (also on buffalo in Sumatra), *T. lativenter, T. flavipilosus, T. atriventer, T. elegans, T. ventriflavimarginalis* (also from Sumatra), *T. fuscifrons, T. rubriscutatus,*

T. crocitinctipennis, *T. nigerrimus* (also on cattle in Sumatra), and *H. irregularis*; from Celebes, *Chrysops atrisignata*, *T. atrisignatus* and *Neobolbodimyia laticornis*; from Sarawak, *T. lentisignatus* (also from the Malay States), and *T. cylindricallosus*; from Riouw Archipelago, *T. undulans*; from Malabar, *T. rectilineatus*; from Timor, *T. aurifer* and *T. argentisignatus*; from Ceram, *T. ceramensis*; from Siam, *T. equicinctus* and *T. ochros*; from Soembawa Is., *T. soembawensis*; from Leyden Is. (Java), *T. platybasiannulatus*; from Nias Is., *T. longirostris*; from Sebesi Is., *T. auriventer*; from Aroe Is., *T. aroeënsis*; from Madoera Is., *T. madoerensis* on horse; from Mysol Is., *T. obtusipalpis*; no locality given, *T. ruficornis* (? Java) and *T. angustipalpis*; and locality unknown, *T. biatripunctatus*.

T. lineatus, Tayl., is treated as a synonym of *T. rufinotatus*, Big.; *T. hilaris*, Wlk., of *T. tenens*, Wlk.; *T. albimedius*, Wlk., of *T. rubidus*, Wied.; *T. sanguineus*, Wlk., of *T. rufiventris*, F.; and *Haematopota stantoni*, Ric., of *H. lunulata*, Macq.

Szilády (Z.). **Kritische Bemerkungen über Enderleins Tabanidensystem.** [Critical Notes on Enderlein's Classification of Tabanids.] —*Zool. Anz.*, lxvi, no. 9–12, pp. 325–328. Leipzig, 20th April 1926.

Enderlein's system of classification of Tabanids is criticised, and a list is given of 33 of his genera, which are reduced to synonyms.

Ussing (H.). **Faunistiske og biologiske Bidrag til danske Simulier's Naturhistorie.** [A faunistic and biological Contribution to the natural History of Danish Simuliids.]—*Vidensk. Medd. dansk nathurhist. For.*, lxxx, pp. 517-542, 10 figs., 1 map, 11 refs. Copenhagen, 1925. (With a Summary in English.) [Recd. June 1926.]

The species of *Simulium* in Jutland can be divided into two groups, river forms and cold-water forms. The number of generations varies in the different species, temperature and locality being important factors. Several generations a year occur of the river forms, *S. argyreatum*, *S. equinum* and *S. ornatum*, and these are the most dangerous species. *S. ornatum* is peculiar as it also occurs in cold springs and in forest brooks, where, however, it is scarce, and has only one or two generations a year. The cold-water forms, *S. latipes* and *S. costatum*, have generally two generations (spring and autumn) and sometimes only one, but the adult stage is certainly of much greater duration than that of the river forms. All the species examined hibernate in the larval stage. Several species occur in the same waters, and larvae and pupae of two or more species may be found together on the same stone or plant.

The eggs of the river forms are found at the surface on plants, most frequently on the undersides of the leaves, and also on stalks of grasses growing on the bank and dipping into the running water. Most eggs are enveloped in a mass of jelly. The egg-stage is comparatively short, lasting probably about a week. The eggs of the cold-water forms are found at the bottom under stones. In dry summers, the brooks in which they occur may nearly dry up, but the eggs can probably

resist a temporary desiccation. Swarms of adults may be found several miles from the water where they were bred, wind being a most important factor in this connection. Mating usually occurs in the air, but is also seen in captivity and sometimes on cattle. Both sexes form swarms.

The only remedy that can be recommended is that of producing a gradually acquired immunity in the cattle. This is attained by letting the animals out for a few hours at a time in April and May. Both young and old animals will soon acquire resistance to the toxin by this means.

SHANNON (R. C.). **The Occurrence of *Phlebotomus* in Panama.**—*Jl. Wash. Acad. Sci.*, xvi, no. 7, pp. 190-193, 5 figs., 1 ref. Washington, D.C., 4th April 1926.

Phlebotomus panamensis, sp. n., was collected by the author in three localities in Panama in 1923, in one case in a cave-like dungeon inhabited by bats and snakes, both of which are probably fed upon by this midge.

BEQUAERT (J.). **Insects and Man in Tropical America.**—*Natural History*, xxvi, no. 2, pp. 133–146, 10 figs., 2 refs. New York, N.Y., April 1926.

Mites of the genus *Trombicula* are troublesome at Para, being abundant on low vegetation. Their attack causes intolerable itching, and, in persons who are particularly sensitive, the effects may be serious. In the forests of the river Amazon, favourable breeding places for mosquitos occur in abundance, especially for malaria-carrying Anophelines, and the jungle on the outskirts of towns is a most difficult problem, the expense of clearing being often out of all proportion to the size of the town.

One of the most troublesome Tabanids is *Lepidoselaga lepidota*, Wied. (*crassipes*, F.).

The higher forests of the Amazon district are relatively free from insect pests of man with the exception of *Phlebotomus*. The yellow fever mosquito, *Aëdes argenteus*, Poir. (*aegypti*, L.), is very abundant on the Lower Amazon, as are also *Culex fatigans*, Wied. (*quinquefasciatus*, Say), *Taeniorhynchus* (*Mansonia*) and *Simulium amazonicum*, Goeldi.

At the time of the author's visit yellow fever was entirely absent from the Amazon Basin, in spite of the abundance of its carrier, and malaria is now, therefore, the chief health problem of the region.

MARTINI (E.). **Methoden zur Untersuchung von Mücken als Infektionsträger.** [Methods of Examining Mosquitos as Carriers of Infection.]—*Handb. biol. Arbeitsmethoden*, Lief. 183 (Abt. xii, Teil 1, Heft 4), pp. 725–768, 12 figs., 38 refs. Berlin & Vienna, Urban & Schwarzenberg, 1925. [Recd. May 1926.]

Methods of collecting and breeding mosquitos and of infecting them with malaria parasites and other organisms are described in detail.

DA ROCHA-LIMA (H.) & SIKORA (H.). **Methoden zur Untersuchung von Läusen als Infektionsträger.** [Methods of Examinaing Lice as Carriers of Infection.]—*Handb. biol. Arbeitsmethoden*, Lief. 183 (Abt. xii, Teil 1, Heft 4), pp. 769-814, 15 figs., 70 refs. Berlin & Vienna, Urban & Schwarzenberg, 1925. [Recd. May 1926.]

This paper describes the collection, feeding and breeding of lice [*Pediculus*], and their artificial infection with disease organisms. A supplement describes their anatomy and biology and methods for destroying them.

ROUBAUD (E.). **L'emploi des poudres larvicides légères dans la lutte contre les moustiques.**—*Bull. Soc. Path. exot.*, xix, no. 4, pp. 287-302, 3 figs., 3 refs. Paris, 1926.

The obvious disadvantages of using oils or liquid larvicides against mosquitos, which frequently renders the water unusable for a time, and is impracticable in dealing with very large breeding areas, led the author to experiment with powders, These, being insoluble, cannot contaminate the water, and being carried by the air are readily disseminated. Trioxymethylene, arsenical powders, and a proprietary substance were all tested and their action is described in detail. Against Anopheline larvae the powder is simply broadcast on the surface of the water ; against Culicines it must be held in suspension to reach the larvae feeding below the surface ; in either case the result is paralysis of the larvae resulting eventually in death. The toxic action of trioxymethylene is not lasting ; the powder upon becoming moist quickly loses its virulence, and applications should be be made once a week in hot weather and every 10 or 15 days in cold weather, but not more frequently than this or the larvae that have ingested only a little at first become immune from its action through frequent small doses. The substance is applied as a fine powder, either from the hand or by means of a sprayer ; in the former case the powder should be mixed with 50 to 100 parts of dry sand. Trioxymethylene is in no sense a repellent, and does not deter female mosquitos from oviposting on treated water, so that the next application will kill newly hatched larvae. Disadvantages of this substance are its high cost and the fact that unless it is ground extremely fine (thus adding to its expense), the heavier particles sink to the bottom and become useless.

Among the arsenical powders that proved efficacious were calcium arsenite, copper aceto-arsenite, arsenic trisulphide and copper arsenite. These may be used in the proportion of 5 per cent. (volume) in an inert powder. The action of these arsenical powders, however, is no more lasting than that of trioxymethylene. A proprietary substance, of which the active principle is formaldehyde, has been prepared in a particular medium chosen to counteract the effects of moisture, and to increase the floating capacity or the maintenance in suspension of the powder. Suspension is easily obtained by lightly beating the surface of the water or by previous emulsion of the product in a little water. Over large swamp areas, the best means of dissemination of the powder is by means of an ordinary sulphur duster (such as is used on vines) ; if the jet of dust is thrown before the operator as he goes, emulsion occurs automatically by his passage through the shallow water. In a swampy district in Alsace that was heavily infested with *Aëdes* spp. (particularly *A. vexans*) in less than a quarter of an hour after treatment

hundreds of dead or dying larvae were floating on the surface or covering the grass and vegetation. This preparation is more lasting in effectiveness than the others, retaining its toxic action as much as 20 hours after contact with water, and the action is also more rapid than that of the arsenicals.

These larvicidal powders are considered very promising and should be chosen with regard to their suitability for the places requiring treatment. Most of them can only be successfully used under certain favourable conditions; if economy is to be considered, arsenic trisulphide should be used. The proprietary substance is the one most highly recommended against both Anophelines and Culicines, particularly for use on a large scale, owing to its rapidity of action and harmlessness to other forms of life.

Sant'Ana Barrets (J.). **La maladie du sommeil dans la Guinée portuguaise.**—*Bull. Soc. Path. exot.*, xix, no. 4, pp. 315–317. Paris, 1926.

In Portuguese Guinea, where *Glossina palpalis* is abundant, but where sleeping sickness has not been observed, a first case of the disease has been recorded in a European who evidently contracted the infection from some immigrant or traveller from equatorial Africa. C. Mathis, commenting on this record, considers that it is rather remarkable that Portuguese Guinea, surrounded as it is by countries in which sleeping sickness is endemic, should have remained so long free from the disease, and that the circumstances suggest further investigations in that region.

Barotte (J.). **Les Trypanosomiases de l'Afrique du Nord.**—*Mém. Soc. Sci. nat. Maroc*, no. xi, viii+183+xxiii pp., 17 pls., 214 refs. Rabat, December 1925. [Recd. May 1926.]

The author discusses the forms of trypanosomiasis in North Africa and their prophylaxis. In a series of appendices he deals with the morphology of *Trypanosoma marocanum*, and with equine trypanosomiasis, dourine, experimental infection of the rat with *T. equiperdum*, the distribution of equine trypanosomiasis in Morocco, and the insect vectors of trypanosomiasis in North Africa. This last includes a discussion of the purely mechanical transmission of the disease by Tabanids and by *Stomoxys calcitrans*, L., and *Lyperosia irritans*, L. A description of each species implicated is given, with notes on synonymy and a key to the subgenera of the genus *Tabanus*; a note on the insect enemies of these flies is included.

Ferguson (E. W.). **Deaths from Tick Paralysis in Human Beings.**—*Rept. Director-Gen. Pub. Health, N.S.W., 1924*, pp. 185–187, 12 refs. Sydney, 1926.

This paper has been noticed from another source [*R.A.E.*, B, xiii, 9].

Ferguson (E. W.). **Mosquitoes of New South Wales.**—*Rept. Director-Gen. Pub. Health, N.S.W., 1924*, pp. 187–191. Sydney, 1926.

This annotated list of the mosquitos of New South Wales does not claim to be exhaustive, but is regarded as a basis for future work, having been compiled from Edwards' synopsis of the adult mosquitos of the Australasian region [*R.A.E.*, B, xii, 113].

ROUBAUD (E.) & COLAS-BELCOUR (J.). **La torpeur hivernale obligatoire et ses manifestations diverses chez nos moustiques indigènes.**— *C. R. Acad. Sci. France*, clxxxii, no. 13, pp. 871-873, 3 refs. Paris, 1926.

Hibernation in mosquitos is generally regarded as being simply a case of torpor due to reduced temperature. The results of research here given show that in reality cold is only rarely the factor that determines enforced rest in the life of mosquitos ; not only is its action often not necessary to cause torpor, but it is, on the contrary, the essential agent for a normal resumption of energy. The suspension of activity that takes place in winter in these insects is almost always due to what may be described as spontaneous biological inertia (asthenobiosis), which can only be overcome after continuous subjection to cold (athermobiosis) [*cf. R.A.E.*, B, xi, 55, 162].

The species in which the metabolic activity reacts regularly to thermal influences and of which all the generations are equally active (homodynamic) appear to be rare : *Theobaldia maculata* [*sic*, ? *annulata*] can oviposit in the height of winter, and its larvae develop as in summer, if the temperature is favourable ; cold causes only a temporary suspension of activity in this mosquito ; at no stage does it undergo a phase of spontaneous biological inertia independent of reduction in temperature. The heterodynamic species appear to be more numerous, *i.e.*, those that are affected in a regular cyclic and spontaneous manner by asthenobiosis independent of cold. These species have a method of hibernation that is constant for each type of mosquito and essential for its renewal of activity.

In the case of *Anopheles maculipennis* and *Culex pipiens*, asthenobiosis is shown in the prolonged sterility of females of late broods. These hibernating females, although fertilised, are unable to mature their eggs for several months, even if kept in a heated atmosphere. Resumption of oviposition in spring can only be effected as a result of a long period of low temperature. According to the author's experiments, in *A. maculipennis* there are only two generations a year ; the first, which is the offspring of hibernating females, is active ; it gives rise to the inactive generation of hibernating females, which are unable to oviposit during the winter months. In the case of *A. plumbeus* (and doubtless *A. bifurcatus*), cyclic asthenobiosis affects the larvae of the autumn brood, the development of which is extremely slow in the early stages, and is practically unaffected by heat.

In the case of certain mosquitos, asthenobiosis does not show a regular, cyclical character. Its appearance is subordinated to curious seasonal influences. *Aëdes* (*Finlaya*) *geniculatus* can hibernate in the egg stage in a condition of anhydrobiosis, hatching on contact with water. If late hatching permits larvae to develop at 18–20° C. [64·4–68° F.], without being subjected to cold, complete development is accomplished in 20–22 days. If hatching takes place in winter, below 15° C. [59° F], the larvae develop normally at first, and then undergo, after the third moult, a progressive retardation of growth, followed by a diapause of several months. When the action of cold has been interrupted by periods of heat, the larval diapause may be overcome by prolonged action of heat at the fourth stage. In this species, larval asthenobiosis is compensated at the beginning and masked by the reactivating effects of anhydrobiosis in the egg stage ; but cold, in its turn, annuls the reactivating effects of anhydrobiosis, as it induces

a torpor that is only terminated if exposure to it is prolonged. The winter preservation of the species is ensured by this complementary intervention of phenomena.

Siler (J. F.), Hall (M. W.) & Hitchens (A. P.). **Dengue: Its History, Epidemiology, Mechanism of Transmission, Etiology, Clinical Manifestations, Immunity, and Prevention.**—*Philipp. Jl. Sci.*, xxix, no. 1–2, pp. 1–304, 8 pls., 20 figs., 38 pp. refs. Manila, 1926.

The following is taken mainly from the authors' summaries : Dengue and yellow fever are transmitted by the same species of mosquito, *Aëdes argenteus*, Poir. (*aegypti*, L.), and the mechanism of transmission for both diseases is strikingly similar. Epidemics of both dengue and yellow fever are, therefore, subject to the same control measures. Epidemics of dengue can only occur when there are present simultaneously cases of dengue fever, large numbers of *A. argenteus*, and large numbers of non-immune individuals. The mechanism of transmission briefly is as follows : the dengue patient infects mosquitos during the first three days of illness ; the infected mosquito is able to transmit the virus eleven days after its infection, and remains infective probably throughout its life ; hereditary transmission of the virus does not occur. The work of the authors in the Philippines has shown conclusively that *A. argenteus* is the transmitter of dengue, and that *Culex fatigans*, Wied. (*quinquefasciatus*, Say) is not ; with regard to other species, particularly of *Aëdes*, their small numbers render them of no importance in the transmission of dengue in and about Manila. Clinical observations with regard to the uncertainty of immunity from dengue have been experimentally confirmed. Natives of areas in which dengue is endemic are immune, but their immunity is believed to be acquired and not natural. The incubation period of dengue fever in non-immune individuals under the natural conditions encountered in the Philippines is usually from four to seven days, inclusive, exceptionally extending to the tenth day after infective biting, but the onset of symptoms may be delayed until the eleventh day in the case of individuals who are partly immune. Carefully controlled studies to identify and attempts to isolate the causative micro-organism of dengue have so far not been successful. It is thought, however, that negative results should not be regarded as conclusive unless based on material obtained during the first 24 hours of the illness, which is almost impossible except by using experimentally induced cases, and this was not done. Campaigns against *Aëdes argenteus* must be based on a consideration of its life habits ; it is one of the most highly domesticated of mosquitos and apparently does not hibernate ; it disappears when the atmospheric temperature falls appreciably below 59° F. (15° C.) and remains there for any great length of time ; it prefers to take blood from man ; it is essentially a day-biter, but may take blood at night ; its average length of life under natural conditions is probably not more than six weeks ; it breeds by preference inside or close to human habitations ; it practically always deposits its eggs in clear water ; its eggs, being very resistant to unfavourable environment, retain their vitality after storage in a dry place for several months ; normally the eggs hatch in three days, and the adults emerge from eight to 15 days later.

Preventive measures are based on two lines of attack, namely, individual precautions and organised mosquito control campaigns.

Patients should protect themselves from the bites of *A. argenteus* during the first three days of their illness ; non-immune persons should avoid houses in which secondary cases of dengue occur. Adult mosquitos in houses should be destroyed, and water should not be allowed to stand in uncovered receptacles in the house or near it for more than seven days. It has been found that if the usual breeding-places of *A. argenteus* are eliminated, the mosquitos will resort to unusual ones for oviposition, thus rendering their eradication more difficult. This difficulty has been overcome by providing attractive breeding-places in artificial water containers, and emptying them every seven days.

Among the features of this paper are a long historical review of yellow fever and dengue, at the conclusion of which the authors express the opinion that both diseases originated in Tropical America, and full descriptions of the technique of breeding *A. argenteus* and *C. fatigans*.

Petrocchi (J.). **Contribución al estudio de los Culicinae en la Rep. Argentina. a) Género *Taeniorhynchus* F. Lynch Arrib. 1891. b) *Psorophora confinis* F. Lynch Arrib. 1891. Su larva.** [A Contribution to the Study of the Culicinae in Argentina. (a) The Genus *Taeniorhynchus*, Arr. (b) *P. confinis*, Arr., and its Larva.]—*Rev. Inst. bact. Dept. Nac. Hyg.*, iv, no. 2, pp. 98-104, 1 pl., 5 refs. Buenos Aires, September 1925. (With Summaries in French, English and German.) [Recd. May 1926.]

The genus *Taeniorhynchus* is represented in Argentina by *T. titillans*, Wlk., and *T. fasciolatus*, Arr. The larva of *Psorophora confinis*, Arr., is here figured.

Nelson (E. W.). **Bats in Relation to the Production of Guano and the Destruction of Insects.**—*U.S. Dept. Agric.*, Dept. Bull. 1395, 12 pp., 4 figs., 4 refs. Washington, D.C., March 1926.

This bulletin deals principally with the Mexican free-tailed bat (*Tadarida mexicana*), a species that lives in large colonies in Mexico and the south-western United States. This bat has been considered to be important as a destroyer of mosquitos in malarious districts, and roosts have been erected to encourage it to form colonies [*R.A.E.*, B, i, 176]. Mosquitos have, however, been found to be abundant in the vicinity of bat caves and bat roosts, and have not diminished appreciably in numbers in the one locality where a successful artificial bat roost has been made [*R.A.E.*, B, viii, 203 ; xiii, 24]. Although bats undoubtedly swallow mosquitos when they encounter them in flight, their principal food consists of larger insects.

King (W. V.) & Bradley (G. H.). **Airplane Dusting in the Control of Malaria Mosquitoes.**—*U.S. Dept. Agric.*, Dept. Circ. 367, 15 pp., 8 figs., 3 refs. Washington, D.C., April 1926.

Some of the more important results of the experiments described in this paper have already been noticed [*R.A.E.*, B, xiv, 86]. The aeroplanes used had been adapted for dusting cotton and carried a light metal hopper containing about 300 lb. of insecticide dust. Paris green appears to be the most suitable mosquito larvicide for aeroplane

dusting, and it was used as the toxic substance in all the experiments ; it is effective in killing the larvae of Anophelines, which are surface feeders, but not those of other mosquitos ; moreover, in the quantities in which it is used, it is not toxic to other insects and fish that prey on mosquito larvae. In most of the experiments from 5 to 50 lb. of Paris green were diluted with 100 lb. of fine silicious earth (Tripoli earth) ; road dust and a mixture of lime and flour were fairly satisfactory diluents, but less well suited for the purpose.

Preliminary experiments in dusting in open fields showed that an aeroplane flying at right angles to the direction of the wind could distribute the dust effectively over a strip 300–400 feet wide, using about 1 lb. of Paris green to 20 acres ; this gave a distribution of at least 10 granules of Paris green to the square inch, the minimum amount toxic to Anopheline larvae in water not protected by vegetation. It was also found that the dust was able to penetrate through trees, even in dense woodland, although in considerably reduced quantities.

The lakes and swamps that are the principal breeding-places of Anophelines in the vicinity of Mound, Louisiana [*R.A.E.*, B, xii, 96] consist usually of a central area of more or less permanent water, generally covered with water plants, surrounded by a dense marginal growth of trees and bushes, liable to be flooded in winter and spring, where breeding is particularly prolific. In dusting cotton from aeroplanes the best time of day is early morning, as the plants are covered with dew ; for the same reason early morning is unsuitable for dusting lakes and swamps. In the most successful experiments, it was estimated that 92 and 100 per cent., respectively, of the larvae were killed. One experiment in dusting a flooded ricefield for the control of Anopheline larvae was very successful, and the quantity of Paris green used was not sufficient to injure the rice. The authors consider that ½ lb. of Paris green per acre is sufficient to give a safe margin in treating such places as ricefields and the open parts of lakes, but that this quantity must be increased for areas protected by trees and bushes.

TWINN (C. R.). **Notes on the Mosquitoes of the Ottawa District.**—*Canad. Ent.*, lviii, no. 5, pp. 108–111. Orillia, Ont., May 1926.

A survey of the mosquitos of the Ottawa district, which in most years are very abundant, has revealed the presence of 23 species, the most troublesome being those of the genus *Aëdes*. The mosquito incidence depends largely on the extent and duration of the river freshet, which is regulated by the amount of winter snowfall and early spring rains. When the river rises gradually, the overwintering eggs are submerged at different times, so that the adults emerge over a long period. *Aëdes stimulans*, Wlk., and *A. hirsuteron*, Theo., are the dominant species, the former in the town and the latter to the north of it. The larvae of *A. stimulans* begin to hatch from overwintering eggs in early April and reach maturity in late April or early May, pupation being general by mid-May. Adults begin to emerge about the 10th of May, are at their maximum in late May and begin to decrease about mid-June. They bite persistently in May and June, and even in July ; they generally occur near their breeding-grounds, but may migrate at least a mile, probably in search of a blood-meal. *A. hirsuteron* develops almost exclusively on a northern breeding-ground that is inundated in early spring by the Ottawa river. It

occurs in great numbers with *A. stimulans*, *A. vexans*, Mg., and *A. cinereus*, Mg., hatching about the same time as *A. stimulans*, and reaches the adult stage in late May or early June, diminishing in early July. This species migrates for short distances, causing much discomfort in neighbouring townships. Others species taken in Ottawa were *A. cinereoborealis*, F. & Y., *A. canadensis*, Theo., *A. fitchi*, F. & Y., *A. excrucians*, Wlk., *A. impiger*, Wlk., *A. intrudens*, Dyar, *A. lazarensis*, F. & Y., and *A. punctor*, Kirby (adult females only), which are all more or less troublesome bloodsuckers, and *A. abserratus*, F. & Y., and *A. triseriatus*, Say, which are rare. *Culex pipiens*, L., and *C. territans*, Wlk., are commonly found, but *C. testaceus*, Wulp, is apparently rare. Only one Anopheline, *Anopheles maculipennis*, Mg., was taken during the survey. Other captures included *Taeniorhynchus* (*Mansonia*) *perturbans*, Wlk., larvae of *Wyeomyia smithi*, Coq., in the pitcher plant, *Sarracenia purpurea*, *Corethra cinctipes*, Coq., *C. culiciformis*, DeG., and *Chaoborus punctipennis*, Say. The larvae of *Corethra* breed chiefly in temporary pools in early spring, where they prey on larvae of *Aedes*.

Kligler (I. J.). **The Epidemiology of Malaria in Palestine. A Contribution to the Epidemiology of Malaria.**—*Amer. Jl. Hyg.*, vi, no. 3, pp. 431–449, 3 charts, 6 refs. Baltimore, Md., May 1926.

In Palestine there are two epidemic periods of malaria, June-July and October-November, and this paper discusses the special conditions responsible for such periodicity.

Two of the chief factors influencing the breeding of Anophelines, temperature and humidity, are fairly constant from year to year in any given part of Palestine, and it may therefore be assumed that the variation of the third factor, rainfall, is mainly responsible for the fluctuation in their annual abundance and distribution. The two principal types of Anopheline breeding-places, stagnant bodies of water and streams, are affected both by the volume and by the distribution of the rains. When the total volume of the winter rainfall is equal to or above the average, its distribution is of great importance, as on it depends whether serious outbreaks of malaria may be expected over the whole country or only in the coastal districts, so that a study of this factor makes it possible to predict with considerable accuracy the probable degree of mosquito prevalence, and to adopt control measures accordingly.

The occurrence of a large number of cases of malaria in March and April must be ascribed to relapses, not to primary infections, as the first spring brood of *Anopheles* does not appear until the end of March or beginning of April. The June-July and October-November epidemics may, however, definitely be attributed to the activity of the Anopheline vectors. Of those occurring in Palestine [*cf. R.A.E.*, B, xii, 85] *A. bifurcatus*, L., is strictly urban and of no importance in connection with rural malaria, *A. algeriensis*, Theo., and *A. hyrcanus*, Pall., are marsh dwellers and have never been found in houses, and *A. multicolor*, Camb., and *A. pharoensis*, Theo., are extremely local and limited in distribution, and cannot be of serious importance in relation to epidemic malaria ; the three remaining species, *A. superpictus*, Grassi, *A. elutus*, Edw., and *A. sergenti*, Theo., were regularly collected in certain places throughout the year, and their relative monthly incidence established. It was found that a definite relation exists between the relative abundance of the last two species, the mean monthly temperature,

and the occurrence of malaria epidemics. *A. elutus* is most abundant in April-May and October-November, which are months with corresponding mean temperatures, evidently the optimum for this species, while *A. sergenti* is most abundant in September-October ; during the hottest months of the year, July and August, all mosquito breeding is reduced. The maximum spring prevalence of *A. elutus*, in May, is exactly a month before the sudden onset of the spring malaria epidemic, while the sharp rise in the numbers of *A. sergenti* in September and its maximum prevalence in October are exactly a month before the onset and peak of the autumn malaria epidemic. The part that *A. elutus* plays in the autumn epidemic is uncertain, but although its second period of abundance is too late to affect the beginning of the epidemic, it is not too late to extend it, and under certain conditions it undoubtedly does so. The occurrence of malaria parasites in *A. elutus* and *A. sergenti* was proved by dissections, cysts or sporozoites being found in the former, and active sporozoites in the salivary glands of the latter.

The spring malaria epidemic in Palestine is due almost entirely to *Plasmodium vivax* (benign tertian malaria) and the autumn epidemic almost entirely to *P. praecox* (*falciparum*) (malignant tertian malaria) ; in one instance in which an epidemic reached its peak in December, it was due to *P. vivax*. These facts, together with the fact that the chief carriers are peasants and nomadic Bedouins, who receive very little quinine treatment, show that the spring occurrence of *P. vivax* and the autumn occurrence of *P. praecox* cannot be explained by the effect of quinine in making the *P. vivax* gametes non-infective to mosquitos, as was suggested by Wenyon. The author advances the theory that there are optimum temperatures for the development of *P. vivax* and *P. praecox*, just as there are for the Anopheline vectors, and that the optimum temperature for *P. vivax* is that of the temperate regions and the temperate season in the sub-tropics, while the optimum temperature for *P. praecox* is that prevailing in the tropics and in the summer in the sub-tropics. A brief survey of literature bearing on this subject shows that there is some difference in the effect of temperature on the development of the two parasites in mosquitos, but that experimental data are not sufficient to warrant any definite conclusion. Experiments to test the validity of this theory are now in progress.

Rodel (P.). **Un poisson grand destructeur de larves de moustiques.**— *Riviera scient.*, xiii, no. 1, pp. 17–18. Nice, 1926.

Sieva, a town in Egypt that formerly suffered seriously from malaria, has been freed from the disease by the use of a fish, *Tilapia* sp., which is an effective destroyer of mosquito larvae. If the difficulties of transport and acclimatisation could be overcome, it is suggested that this fish should be imported into the south of France.

Ross (Sir R.). **Malaria-control in Ceylon Plantations.**— *Jl. Trop. Med. & Hyg.*, xxix, no. 10, pp. 150–155. London, 15th May 1926.

Although great advances have been made in the control of domestic Culicine mosquitos in the East in the last 25 years, much still remains to be done in controlling malaria by measures against the Anophelines, which breed in natural waters not necessarily close to habitations. In Ceylon the activities of the Government Malariologist are confined

mainly to the towns and villages, and do not at present extend to the large estates, where, however, malaria is an important economic factor. In a recent visit to Ceylon the author obtained striking figures showing the actual monetary loss due to malaria on a group of five rubber estates. Two alternative schemes for the organisation of malaria surveys and mosquito control work on the Ceylon estates are outlined and discussed.

TAKAHASHI (R.). **Insects living in hot Springs. II.** [*In Japanese.*] —*Trans. Nat. Hist. Soc. Formosa*, xvi, no. 84, pp. 96–99. Taihoku, June 1926.

An Anopheline larva is recorded from a hot spring in Formosa, the temperature of which was 43° C. [109·4° F.].

[SHAKHMATOV (A. P.).] **Шахматов (А. П.). Malaria in the Chulim Region according to the Expedition of 1925.** [*In Russian.*]—*Russian Jl. Trop. Med.*, 1926, no. 2, pp. 25–40. Moscow, 1926.

Owing to the severity of malaria in certain districts of the Tomsk Government (Western Siberia), an expedition was organised to study the prevailing conditions in the endemic area of the Chulim river (a tributary of the Ob). The topography of the country, the habits of the population and the local prevalence of the disease are discussed. *Anopheles maculipennis*, Mg., and *A. bifurcatus*, L., were the only malaria carriers found. A peculiarity of these Anophelines, under local conditions, is the fact they are not exclusively domestic or nocturnal insects. They occur in abundance at some distance from the villages in the flooded meadows, where they readily attack man in broad daylight. The local habit of the population of camping near these meadows is an important epidemiological factor in the distribution of malaria.

The following Culicines are recorded: *Culex pipiens*, L., *Aëdes maculatus*, Mg. (*C. cantans*, Mg.), *A. communis*, DeG. (*C. nemorosus*, Mg.), and *A.* (*C.*) *annulipes*, Mg.

[SHINGAREV (N. I.).] **Шингарев (Н. И.). New Information on Culicidae of U.S.S.R.** [*In Russian.*]—*Russian Jl. Trop. Med.*, 1926, no. 2, pp. 47–48. Moscow, 1926.

A list is given of the eight Anophelines so far recorded from Russia, among which *Anopheles elutus*, Edw., is treated as a synonym of *A. sacharovi*, Favr, and to which the following are now added: *Anopheles martinius*, sp. n., *A. listoni*, List., *A. algeriensis* var. *turkestani* n., *A. hyrcanus* var. *mesopotamiae*, Chr., and *A. superpictus* var. *berestnevi*, n., from Turkestan; *A. algeriensis*, Theo., from Turkestan and North Caucasus; and *A. aitkeni*, James, and *A. hyrcanus* var. *marzinovski*, n., from the Caucasus. Only the more important distinguishing characters of these new species and varieties are discussed, but full descriptions are to be published later.

Other mosquitos recorded for the first time from Russia are: *Culex orientalis*, Edw., from Ussuri (Eastern Siberia); *C. tipuliformis*, Theo., from the Caucasus; *Aëdes punctor*, Kirby, var., from European Russia; *A. pulchritarsis*, Rond., var., from Turkestan; *Uranotaenia unguiculata*, Edw., var., from the Caucasus; and *Orthopodomyia*

pulchripalpis, Rond., from the Caucasus. The last named is constantly found with the larvae of *Anopheles plumbeus*, Hal., and frequently with those of *Aëdes geniculatus*, Ol.

Larvae (3rd stage) of *Anopheles maculipennis*, Mg., were found at the beginning of November and again on the 28th November near Moscow, the temperature of the water being 3° C. [37·4° F.]. They have remained in this stage for about two months. As a rule this species moults within 2–5 days, according to the temperature conditions, and is not found after the end of October. These observations suggest the possibility of *A. maculipennis* hibernating in the larval stage.

[Lindtrop (G. T.).] **Линдтроп (Г. Т.). Observations on *Anopheles pulcherrimus*, Theo., and *A. hyrcanus*, Pall. (*pseudopictus*, Gr.), in Azerbaijan in 1925 and the Zones of *A. superpictus*, Gr., in Transcaucasia.** [*In Russian.*]—*Russian Jl. Trop. Med.*, 1926, no. 2, pp. 48–55, 10 refs. Moscow, 1926.

The seasonal and local distribution of *Anopheles pulcherrimus*, Theo., in Transcaucasia is discussed. It is noteworthy that its absence in 1912 and 1925 from places in which it was generally found was preceded by severe winters in 1911–12 and 1924–25. *A. superpictus*, Gr., was found in greater abundance than previously during the autumn of 1925. *A. hyrcanus*, Pall., though previously said to be rare in Transcaucasia, is widely distributed.

[Beklemishev (V.) & Mitrofanova (Yu.).] **Беклемишев (В.) и Митрофанова (Ю.). On the Ecology of the Larvae of *Anopheles maculipennis*, Meig.: The Problem of Distribution.** [*In Russian.*] —*Bull. Inst. Recherches biol. & Sta. biol. Univ. Perm*, iv, pt. 7, pp. 285–332, 2 figs., 35 refs. Perm, 18th May 1926. (With a Summary in English, pp. 332–337.)

Further observations [*R.A.E.*, B, xiii, 109] have been made in the region of the Kama river in the Government of Perm (European Russia). Various types of water and their composition are discussed, ranging from types in which no larvae of *Anopheles maculipennis*, Mg., were found to those in which they occurred in abundance in all stages (at least 10 larvae taken at each dipping). The optimum conditions for the existence of the larvae appear to be calm water, a depth of about 12–20 inches, direct sunlight, supersaturation with oxygen, neutral or weak alkaline reaction (pH 7·1–7·95), and a rich submerged vegetation and fauna. A large series of experiments have been made from which it is concluded that at least the young larvae are able not only to exist, but to feed and develop in water containing less than 2 mg. of oxygen per litre, and with a pH of less than 7·0, that is, conditions under which they are never found in the field. Under such conditions older larvae did not survive, and the gut was always found to be empty, indicating that death is a result of starvation and not of lack of oxygen or unsuitable hydrogen ion concentration. When young, the larvae are almost entirely vegetable feeders, whereas in the later stages they chiefly feed on animal matter. The contents of the gut of 120 larvae of different stages caught at the same time are described. In some cases wing scales of adult Anophelines were found.

The relative development of the anal gills during the growth of the larvae of *A. maculipennis* is discussed. In the young stages the cutaneo-branchial breathing is more developed than later. Some experiments were attempted for the purpose of estimating the relative value for the larva of both dissolved and atmospheric oxygen, *i.e.*, cutaneo-branchial and stigmatic respiration respectively. It was found that none of the larvae could live entirely deprived of atmospheric air even in running water saturated with oxygen (at temperature of 15–30° C. [59–86° F.]), but that the younger larvae withstood the lack of atmospheric air better than the older ones. It is therefore concluded that atmospheric respiration is a most important factor in the welfare of the larvae and apparently a low oxygen concentration in natural waters is not the direct cause preventing the life of *A. maculipennis* in such water, the same probably applying also to the pH reaction of the water ; both these factors, however, may very likely affect the larvae in some indirect way. The absence of suitable food is apparently the direct factor making any particular piece of water unfit for the development of the larvae, and this is frequently influenced by a lack of dissolved oxygen or acid reaction of the water.

The fact that eggs are seldom, if ever, found in nature in waters in which the larvae cannot mature, whereas in similar water under laboratory conditions eggs can hatch and the larvae develop up to a certain point, indicates that under natural conditions the distribution of the larvae is governed by the discrimination of the ovipositing adults. They are apparently guided by a definite instinct to suitable breeding-places. As it is unlikely that the future food of the larvae would attract the adults, their selective instinct probably depends on scent, sight and taste. As the larval food occurs in waters with certain pH reactions and oxygen content, their scent can probably be appreciated by the mosquitos at some distance ; having reached the water, their final selection is made by taste and the requisite calm determined by sight. It is, however, very difficult to prove this hypothesis experimentally, as mosquitos in captivity cannot be depended on to act in a normal manner.

DARLING (S. T.). **Mosquito Species Control of Malaria.**—*Amer. Jl. Trop. Med.*, vi, no. 3, pp. 167–178, 4 refs. Baltimore, Md., May 1926.

The aim of this paper, which is based on observations made in Java, is to emphasise the importance of field studies in all malaria control problems, and to point out that what appears a physically and economically impossible task may prove to be quite feasible when the species of mosquito responsible for transmitting malaria in the particular district is known and its breeding-places have been studied [*cf. R.A.E.*, B, xii, 163].

As a result of a series of malaria surveys in different parts of Java from sea level to an elevation of 3,600 feet, the author concluded that ricefields are not in themselves necessarily responsible for the breeding of malaria-carrying Anophelines, but that neglected and submerged fallow ricefields and grass-grown irrigation ditches are the chief breeding-places. A somewhat detailed account is given of the conditions with regard to malaria and mosquito breeding in the Tjihea Plain [*R.A.E.*, B, xii, 47] ; here the only important carrier of malaria

was *Anopheles aconitus*, Dön., which bred only in the irrigation ditches and wet fallow ricefields, while neither this nor any other species of Anopheline bred in the ricefields under cultivation while they were wet.

In the plains of north Java near Cheribon there is little or no malaria except on the coast itself. At a fishing village on this coast malaria was very severe, and it was found that *Anopheles ludlowi*, Theo., was breeding freely in neglected and abandoned fish-ponds ; at a village only one and a half miles away, where the inhabitants cultivated rice and sugar-cane, there was no malaria except among persons who had spent nights at the coast village ; only one specimen of *A. ludlowi* was taken in this village, and none of the Anophelines breeding in the fallow ricefields were species recognised as efficient carriers of malaria.

Dunn (L. H.). **The Prevalence and Distribution of the Yellow Fever Mosquito, *Aëdes aegypti* (Linn.), in Venezuela.**—*Amer. Jl. Trop. Med.*, vi, no. 3, pp. 181–193, 1 map. Baltimore, Md., May 1926.

In a detailed survey of 26 townships in the northern half of Venezuela to determine the extent of the occurrence of *Aëdes argenteus*, Poir. (*aegypti*, L.), in three towns this mosquito was not found breeding, and there was no evidence of its presence, but in the remaining 23 it was found breeding on the premises of 47 per cent. of the houses visited.

Davis (N. C.) & Boyd (M. F.). **The Occurrence of Quartan Malaria in the Low Coastal Regions of the State of Rio de Janeiro, Brazil. An Epidemiological Study.**—*Amer. Jl. Trop. Med.*, vi, no. 3, pp. 195–203, 5 refs., 1 map. Baltimore, Md., May 1926.

Detailed investigations were made from 1922 to 1925 of the occurrence of quartan malaria (*Plasmodium malariae*) in four towns in the State of Rio de Janeiro, and particularly of the possible relationships between the various cases, which were very few, although infections due to *P. vivax* and *P. praecox* (*falciparum*) were common ; it is thought, however, that some infections due to *P. malariae* were probably passed over or wrongly diagnosed. Quartan malaria probably fluctuates in the same way as tertian, and occurs in definite foci ; the localisation of the infections suggests that the Anophelines concerned in its transmission either have limited flight ranges or return to the same neighbourhood with considerable accuracy. The persistence of infections due to *P. malariae* during months of low fever incidence has been verified.

Glaser (R. W.). **The Isolation and Cultivation of *Herpetomonas muscae-domesticae*.**—*Amer. Jl. Trop. Med.*, vi, no. 3, pp. 205–219, 2 pls., 12 refs. Baltimore, Md., May 1926.

Previous attempts to obtain pure cultures of *Herpetomonas muscae-domesticae* had been unsatisfactory on account of the difficulty of obtaining the flagellate free from bacteria. The successful method employed by the author was as follows : The alimentary tracts of house-flies (*Musca domestica*, L.) were dissected out and triturated in a drop of physiological salt solution ; on finding a heavily parasitised individual the drop was diluted with 2 cc. of salt solution, and a drop

of the resulting mixture was injected into each of 10 or 15 fourth or fifth stage silkworm larvae (*Bombyx mori*, L.). Usually in from 24 to 72 hours the majority of the silkworms died of bacterial septicaemia, and Herpetomonads were never found in the dead silkworms ; in the surviving silkworms, however, actively motile Herpetomonads were found in the blood in 72 hours, while there was no bacterial infection. The flagellates did not multiply in the blood of the silkworms, and began to disappear after 72 hours. Silkworm blood containing flagellates was inoculated into a medium prepared from the expressed body fluids of silkworms. Several other media are described in which the author obtained cultures of the flagellate by transplanting from the silkworm medium.

In six days after the inoculation of *H. muscae-domesticae* into the silkworm medium the flagellates become very plentiful, and the medium shows signs of faint turbidity ; in sixteen days the flagellates have increased tremendously, but are still of the Herpetomonad type ; from this time until forty-five days the cultures reveal not only Herpetomonad types but also oblong and round forms, with and without flagella, resembling Leishman-Donovan bodies ; these forms the author designates Leishmaniform types. After forty-five days motile forms become fewer and the Leishmaniform types, which, although not cysts, are evidently the resting stages of the parasite, dominate.

If an old culture from silkworm medium, containing mainly Leishmaniform types, is inoculated into blood agar, masses of round and dividing Leishmaniform types are to be seen in four days, and in one or two days more the round types elongate, become motile, and assume the form of true Herpetomonads. The development of Leishmaniform types from flagellates inoculated from silkworm medium into blood agar and the subsequent development of active cultures when these are again transplanted into fresh blood agar are described.

Noguchi (H.). **The Differentiation of Herpetomonads and Leishmanias by Biological Tests.**—*Science*, lxiii, no. 1637, pp. 503–504. New York, N.Y., 14th May 1926.

The question of possible insect or plant hosts of *Leishmania* spp. is one of considerable practical importance in the study of the mode of infection in kala-azar, American leishmaniasis and oriental sore. A new method of identifying these organisms among the flagellates of the Herpetomonad type that live in insects and plants is the comparison of the serological and carbohydrate-fermenting properties of cultures of them.

It was thus found possible to identify a species, *Herpetomonas oncopelti*, sp. n., cultivated from *Oncopeltus fasciatus*, another bug of the same genus from Peru, and *Lygaeus kalmii*, and from two plants, *Asclepias syriaca* and *A. nivea*, and to differentiate this flagellate from another, *H. lygaeorum*, sp. n., isolated from a second *A. syriaca* and from another *L. kalmii*. The former ferments 13 carbohydrates, the latter only 3.

Three strains of fly flagellates, one from *Musca domestica*, and the others from *Calliphora* spp., showed some morphological differences, and their specific status was clearly brought out by serological and fermentation tests. The house-fly strain, *H. muscidarum*, sp. n., ferments 14 carbohydrates, one strain from *Calliphora*, *H. media*, sp. n., ferments 7, and the other, *H. parva*, sp. n., ferments 6.

Herpetomonads from adults of *Anopheles quadrimaculatus*, and from larvae of *Culex pipiens*, were found to belong to a single species, *H. culicidarum*, sp. n., which fermented most of the 17 carbohydrates tested, including amygdalin, which was not attacked by any of the others.

Cultures of *H. ctenocephali* and *Trypanosoma rotatorium* were found to be serologically different from all the other flagellates, and from *Leishmania* spp. They did not attack any of the carbohydrates of the series.

Leishmania tropica, *L. brasiliensis*, *L. infantum* and *L. donovani* resemble one another morphologically; in serological reaction, *L. infantum* and *L. donovani* proved to be very closely related. In fermentation tests *Leishmania* spp. resembled most nearly the strains isolated from the Calliphorines. No immune serum prepared with other strains had any effect on *Leishmania*, nor did leishmania-immune sera have any action on the insect or plant strains.

[Popov (P. P.).] Popow (P. P.). **Ueber einen neuen russischen *Phlebotomus* und die bisher in Russland entdeckten Phlebotomen.** [A new Russian *Phlebotomus* and the Species of *Phlebotomus* hitherto discovered in Russia.]—*Arch. Schiffs- u. Trop.-Hyg.*, xxx, no. 6, pp. 240–248, 4 figs., 12 refs. Leipzig, 1st June 1926.

Phlebotomus li, sp. n., is described from Armenia, where it is found in August and September. During the past three years the author has collected the following records: From the Crimea, *P. papatasii*, Scop., and *P. perniciosus*, Newst.; from the Caucasus, *P. papatasii*, *P. perniciosus*, *P. caucasicus*, Marz., *P. minutus*, Rond., *P. duboscqui*, Nev.-Lem., and *P. li*; from Turkestan, *P. papatasii*, *P. perniciosus*, *P. caucasicus*, *P. minutus*, and *P. li*. *P. crimicus*, Shtefko, was not taken by the author in the Crimea. As all the six species in the Caucasus occurred in Armenia in August and September, it was not possible to say which was responsible for the sand-fly fever then present. A list is given of all the known species that have only four spines in the distal segments of the upper claspers in the males. *P. minutus* is omitted from this list because in this species all four spines are apical.

Sergent (Ed. & Et.), Parrot (L.), Donatien (A.) & Béguet (M.). **Transmission expérimentale du bouton d'Orient (Clou de Biskra) à l'homme par *Phlebotomus papatasi* (Scopoli).**—*Ann. Inst. Pasteur*, xl, no. 5, pp. 411–430, 5 figs., 15 refs. Paris, May 1926.

A detailed account is given of experiments with *Phlebotomus papatasii*, Scop., as a transmitter of oriental sore, which have previously been noticed in a briefer form [*R.A.E.*, B, x, 39]. The history of the investigations, which began in 1904 and were resumed after the War, is outlined, and the reasons causing the authors to eliminate as possible carriers all other Arthropods that have been suspected in this connection are explained. It is considered significant that of the four volunteers who were inoculated with an extract from the bodies of *P. papatasii*, three who were born in Algeria and have spent much time in regions infected with oriental sore did not develop any signs of the disease, while the typical lesion was produced in the fourth, who had only been in Algeria for 18 months. Inoculation

of the virus from this case into white mice and dogs produced in the animals local reactions exactly similar to those obtained by other investigators with *Leishmania tropica*. Certain criticisms throwing doubts on the conclusiveness of these experiments are dealt with by the authors, who, however, admit that many details regarding transmission of the disease remain unelucidated. It is not known, for example, how or in what form the parasite passes from the invertebrate host, nor whether there is a reservoir of the virus other than the insect. It may be that other species of *Phlebotomus* may act as carriers in some of the many endemic centres of the disease, but it is considered that the main problems in the aetiology of oriental sore have been solved.

Reports of the Kala-azar Commission, India. Report no. I (1924-25). —*Indian Med. Res. Memoirs*, no. 4, 288 pp., numerous pls., figs., refs. Calcutta, February 1926.

This report embodies the results of the first year's work of the Commission recently constituted in India for the study of kala-azar, and as it consists of separate papers arranged under general headings, a brief introductory account of the objects of the Commission and the results of their work up to date is given by S. R. Christophers.

Previous work concerning the possibility of transmission by various Arthropods and other means is reviewed, including the possibility of ingestion of infective material [*R.A.E.*, B, iii, 28; xi, 156].

The positive results, recorded in the present memoir by Greig & Christophers, by injecting infective matter into the lumen of the intestine of a monkey, are not conclusive as, in spite of all precautions, infection by the needle track cannot be absolutely excluded; unfortunately also, the positive result obtained has not enabled the authors to say whether this was brought about through the spleen puncture material or through the cultural form of the parasite. Should the parasite, especially the flagellate or post-flagellate resistant stage of Row [*cf. R.A.E.*, B, x, 230], be shown to be capable of infecting through ingestion, this would prove a high resistance of the parasite and a special adaptation on its part for infection by such a route.

The readiness with which the parasite develops in *Phlebotomus argentipes*, Ann. & Brun., has made any other line of investigation for the present less urgent. Though the parasite occurs but scantily in the peripheral blood, some 25 per cent. of the flies fed on infected persons regularly develop flagellate infections, so that the gut of *P. argentipes* appears to be an extremely favourable medium for the development of the parasite. That the infections are without doubt *Leishmania* (*Herpetomonas*) *donovani* is shown in the third of the papers noticed below.

In view of the results obtained by Shortt, Barraud and Craighead [*R.A.E.*, B, xiv, 77], only experimental transmission by the sandfly would seem to be necessary to prove finally the role of *P. argentipes* in the transmission of kala-azar.

Many of the papers in this memoir have already appeared, and those having an entomological aspect have already been noticed [*R.A.E.*, B, xiii, 30, 79; xiv, 11, 12, 75, 76, 77]. Others are dealt with in the succeeding abstracts.

Christophers (S. R.), Shortt (H. E.) & Barraud (P. J.). **The Morphology and Life Cycle of the Parasite of Indian Kala-azar in Culture.**—*Indian Med. Res. Memoirs*, no. 4, pp. 19–53, 7 pls., 4 figs., 1 chart, 19 refs. Calcutta, February 1926.

This study of *Leishmania* (*Herpetomonas*) *donovani*, obtained by spleen or liver punctures of cases of kala-azar, was made in view of the probable importance of the flagellate stages of the parasite, which appear in culture, in the natural transmission of the disease.

Christophers (S. R.), Shortt (H. E.) & Barraud (P. J.). **Development of the Parasite of Indian Kala-azar in the Sandfly** *Phlebotomus argentipes*: **Re-fed Flies and further Results of the Feeding of Sandflies on Kala-azar Cases.**—*Indian Med. Res. Memoirs*, no. 4, pp. 141–145. Calcutta, February 1926.

Unless special precautions are taken all individuals of *Phlebotomus argentipes*, Ann. & Brun., whether caught in nature or bred in the laboratory, have usually been fertilised by the time that experiments with them are begun, and if they are fed on a person infected with kala-azar, the eggs develop without a further meal of blood. Such flies will not feed before oviposition, and after oviposition they almost invariably die, the chances of keeping them alive for more than five days being very remote. If, however, they are unfertilised when first fed, they will frequently feed again on the fourth day, and will generally remain alive until the eighth or ninth day, and if placed with males at the second feed, they oviposit. In one instance a fly oviposited a second time after a further feed. In all, 17 flies were fed a second time and were dissected at various periods up to 8 days. Four of these showed flagellate infections, but only in one did it seem probable that the infection was derived from the first meal. In this case there was a very heavy flagellate infection of the alimentary canal with numerous parasites fixed and free in the midgut, free forms being present in the intestine and rectum. Although numerous flagellates were present about the proventricular fold, none were seen anterior to it.

The proportion of infection found in the twice-fed flies was small compared to those fed only once, but as only a small number were dealt with, this may merely have been chance. Unfertilised females digested the blood more slowly and less completely than did fertilised ones. In the fertilised females the last trace of blood has usually disappeared by the 4th day, but in unfertilised females there is still a considerable amount of brown blood-stained fluid at this time. This condition is probably unfavourable to the development of the flagellate. It is also possible that the flagellates developing after the first meal are destroyed by the second feed, though as in one case a heavy infection, apparently due to the first feed, was found, this is not necessarily the case.

An infection of the mouth cavity, in a broad sense, seems the most probable means by which infection might be transmitted from the sandfly to man, and the failure in the small number of flies dealt with to obtain such an infection in no way diminishes the probability of its occurring. There is also the possibility that regurgitation from the midgut may take place in the earlier stages of feeding, or that the passage of infective material may take place by way of the rectum. The subject requires further investigation.

Christophers (S. R.), Shortt (H. E.) & Barraud (P. J.). **Development of the Parasite of Indian Kala-azar in the Sandfly** *Phlebotomus argentipes*: **Controls.**—*Indian Med. Res. Memoirs*, no. 4, pp. 135–139, 1 ref. Calcutta, February 1926.

The authors' previous experiments with *Phlebotomus argentipes* fed on kala-azar patients [*R.A.E.*, B, xiii, 79; xiv, 11] were devoted mainly to the study of the development of the flagellate in the sandfly, and the evidence of the identity of the flagellate with *Leishmania donovani* was to some extent circumstantial. The present paper compares the results of dissecting sandflies caught in nature and not fed, those bred and fed on healthy persons, and others fed on kala-azar patients. Of 222 flies bred or caught and fed on kala-azar patients, 52 were infected with Herpetomonads, while 97 flies caught and not fed, and 116 flies bred and fed on healthy persons showed no flagellates. The flies fed on kala-azar patients and the control flies were in every case treated similarly, and the conclusion seems absolutely justified that the flagellates found with regularity in over 20 per cent. of the former are *Leishmania donovani*, the parasite of kala-azar. Owing to the possibility of sandflies caught wild being infected with kala-azar these were not allowed to feed on healthy persons, and they could not be readily induced to feed on animals.

Napier (L. E.) & Smith (R. O. A.). **Further Observations on the Feeding of Sandflies,** *Phlebotomus argentipes*, **on Cases of Kala-azar in Calcutta.**—*Indian Med. Res. Memoirs*, no. 4, pp. 147–153. Calcutta, February 1926.

In a previous paper by Knowles and the present authors [*R.A.E.*, B, xiii, 30] it was proved that when laboratory bred individuals of *Phlebotomus argentipes* were fed on the blood of kala-azar patients, flagellate forms of *Leishmania donovani* developed in the gut of 44 per cent. of the flies. In view of the fact that the normal life-cycle of the sandfly appears to include only one blood-meal and that considerable difficulty has been experienced in persuading the flies to take a second, the possibility that the flagellate infection in the sandfly is transmitted to the next generation of flies and thence back to man is suggested. This transmission might take place through the egg, by the ingestion by the larvae of infected faeces of the adult, or by the ingestion by the larvae of the dead body of the adult. The first two suggestions seemed improbable, the second because the majority of the flagellates appear to remain in the midgut or foregut of the fly. The third method appeared possible and was investigated. The larvae of the second instar devoured the dead adult flies quite readily, provided that more suitable food was not obtainable.

In the experiments carried out since March a large number of larvae have been fed on flies infected with flagellates, and the adults ensuing from them have been dissected. So far 132 flies and 24 larvae have been dissected, but no recognisable form of *Leishmania* has been found. In a number of flies the oesophageal diverticulum contained numerous highly refractile round bodies about the size of very large cocci, but no stained specimens could be obtained. Though no definite advance in the problem has been made, certain points of interest have arisen.

The factors that influence the occurrence or otherwise of flagellates in the gut of *P. argentipes* are the presence or otherwise of viable

(K3024) Wt P 5/35 1,500 8/26 H & Sp Gp 52

forms of *Leishmania* in the blood meal taken, the prevailing temperature conditions (wet-bulb), and the presence or otherwise of other organisms in the gut of the fly.

Though the observations described are not absolutely conclusive, they suggest that if flagellation occurs at all during the two coldest months, the flagellation rate is very low, reaching its highest point during the monsoon months.

CHRISTOPHERS (S. R.), SHORTT (H. E.) & BARRAUD (P. J.). **The Feeding of Larvae of *Phlebotomus argentipes*, Annandale and Brunetti, on Cultures of *Leishmania donovani*.**—*Indian Med. Res. Memoirs*, no. 4, pp. 155–156, 1 ref. Calcutta, February 1926.

In cultures of *Leishmania donovani* and other species of *Leishmania* the appearance after a certain period of small globular or sub-globular bodies is of constant occurrence. They are also found in cultures of the natural Herpetomonad parasites of various insects, and forms indistinguishable from them occur regularly in the hind-gut and rectum of such parasitised insects. It has been generally supposed that these forms represent a resistant or " cystic " stage of the flagellate, and that when ingested by the larval or other stages of the insect concerned, they lead to infection of the next generation, thus preserving their own species. Experiments are described that were undertaken in order to determine whether, by reproducing as nearly as possible the conditions under which insect larvae become infected with their natural flagellates, it would be possible so to infect the larvae of *Phlebotomus argentipes* with the " cystic " forms of *L. donovani* found in cultures.

The larvae were kept throughout at a temperature varying between 26 and 27° C. [78·8–80·6° F.] and fed on rabbits' faeces on which a rich culture of *L. donovani* was distributed at intervals of a few days. They developed and pupated in a normal manner. Of the 50 larvae dealt with only 22 emerged as adults ; they were dissected immediately and proved uniformly negative as regards the presence of flagellates. It is hoped to continue these experiments to see whether the larvae at any stage short of emergence as adults acquire a flagellate infection, and whether the feeding of the emerged adult may not allow the development of flagellate forms possibly present in a dormant aflagellate condition.

NAPIER (L. E.) & SMITH (R. O. A.). **A Study of the Bionomics of *Phlebotomus argentipes*, with Special Reference to the Conditions in Calcutta.**—*Indian Med. Res. Memoirs*, no. 4, pp. 161–172, 6 pls., 1 chart, 4 refs. Calcutta, February 1926.

The survey previously recorded [*R.A.E.*, B, xiii, 123] was carried out during the early part of 1924, and the present one was begun in June of the same year. At first the sandflies were collected almost exclusively from Calcutta and its suburbs, but from April they were also collected from a village about 3 miles outside the city, under entirely rural conditions.

Phlebotomus argentipes was found in cattle sheds, human sleeping quarters and chicken houses. In 4 out of 5 instances in which flies were found in houses in the northern area cows were actually kept on

the ground floor of the house and in the fifth they were kept in the adjoining house. Flies were never found in any of the upper rooms. In the cattle sheds they were generally caught in dark corners. On a number of occasions they were caught in buildings used as fowl houses, in small masonry or mud fowl coops, and even in small wooden fowl boxes. They were never found in horse stables.

Larvae were found in rooms the floors of which were covered with earth and fowl droppings, and in a building in which goats had been kept, the soil in these cases being rich in nitrogenous matter.

No larvae were found in the open, though repeated search was made in apparently suitable sites. It seems probable that the eggs are laid in sites similar to those mentioned above, though it is unlikely that they are not occasionally laid outside in suitable moist and protected places.

P. argentipes has been caught throughout every month of the year, and a chart is given showing the association between the prevailing temperature and hygrometric conditions and the incidence of this fly, as indicated by the size of the catches in 6 different sites.

Under the most favourable conditions the whole life-cycle takes about 30 days, the egg, larval and pupal stages requiring 4, 14 and 7 days respectively. If unfed, the adults die about the third day; if fed on the second day, they oviposit on the fifth or sixth day, dying immediately afterwards. If not mated, females will take another meal on the fifth day and survive until the ninth or tenth day, and occasionally they may be induced to feed a third time and survive until about the 15th day. The various factors influencing their development, such as humidity, temperature, etc., are discussed.

The larvae seem to thrive best on dried rabbits' faeces and dried human blood, they can also live on fowl faeces or dead insects. The adult female is exclusively a blood feeder.

The larvae and eggs are destroyed by a mite, *Gamasus chandleri*, Ewing, and both ants and cockroaches attacked the breeding trays and destroyed the larvae. During April a Gregarine infection was noticed in about 80 per cent. of the larvae in the trays.

CHRISTOPHERS (S. R.), SHORTT (H. E.) & BARRAUD (P. J.). **Technique employed in Breeding** *Phlebotomus argentipes* **in Assam.**—*Indian Med. Res. Memoirs*, no. 4, pp. 173–175, 1 pl., 5 refs. Calcutta, February 1926.

The female flies, when caught, are examined, and those likely to oviposit are kept for this purpose and placed in a Petri dish 4 inches in diameter and containing several thicknesses of damp filter paper, which must be kept damp. Rabbit or goat faeces are placed on the paper as food for the larvae, the material being prepared by placing it in a thin layer in an oven at 60° C. [140° F.] for one hour in order to destroy any possible natural enemies of the larvae. After spreading it in the dish, a few drops of water are added to keep it moist. A globular lamp glass, 6 inches high with an opening at the bottom $2\frac{1}{2}$ inches in diameter and a short chimney at the top about 2 inches in diameter, is placed on the filter paper and fixed by packing cotton-wool tightly between the rim of the dish and the lower outer rim of the glass. This packing must be kept damp. A dry piece of filter paper is fixed vertically inside the glass as a resting place for the flies. The latter

are transferred from test tubes to the glass through a hole in a piece of cardboard over the upper opening ; the opening is then closed with a plug of dry cotton wool. It is advisable to keep the apparatus at a temperature of 24–26° C. [75·2–78·8° F.]. When all the flies are dead, the glass and cotton wool are removed and the cover of the dish is put on. The dish is kept in the dark in an incubator at the above temperature during the egg and larval stages. Towards the end of the second week of larval life, no more water should be added, and the contents of the dish may be allowed to become gradually drier. As soon as any adults emerge, the dish is transferred to a small cage made of muslin fastened to a wooden frame with a glass top. A sleeve is fastened to one side, large enough to allow the hand and dish to be inserted. The lid of the dish is removed, and the adults are allowed to fly out and are caught in test tubes. This technique is simple and convenient provided a considerable number of gravid females can be obtained though there is a heavy mortality amongst the larvae, judging by the, number of eggs laid and the number of adults obtained. The careful measures regarding the selection and preparation of the food material have only been adopted recently, and it is hoped by this means to increase the proportion of adults bred.

CHRISTOPHERS (S. R.), SHORTT (H. E.) & BARRAUD (P. J.). **The Anatomy of the Sandfly** *Phlebotomus argentipes*, **Ann. and Brun. (Diptera). I. The Head and Mouth Parts of the Imago.**—*Indian Med. Res. Memoirs*, no. 4, pp. 177–204, 10 pls., 2 refs. Calcutta, February 1926.

The contents of this paper are indicated by its title.

BARRAUD (P. J.). **Report upon a Sandfly Survey of Madras Town.**—*Indian Med. Res. Memoirs*, no. 4, pp. 207–218, 4 maps, 1 ref. Calcutta, February 1926.

A house to house search for sandflies was made in Madras in July, both in parts of the town where kala-azar appears to be endemic and in others where it is almost absent. At this time there was some rain after a dry and hot spell. *Phlebotomus argentipes*, Ann. & Brun., was by far the commonest sandfly ; it was found in 20 out of 24 houses in which there were cases of kala-azar at the time of the survey or in which there had been cases a short time previously. It may be found in all parts of the town, but is apparently local ; it is retiring in its habits and usually occurs only in moderate numbers in houses, although sometimes more abundantly in stables and cow-sheds ; it was noticed in some houses that individuals began to appear high up on the walls of living rooms between 8 and 9 p.m., which seemed to indicate that they had been hiding in crevices in the ceiling. The fact that *P. argentipes* was not found in many houses was possibly due to the time at which they were searched, usually in the early morning or early evening.

P. papatasii, Scop., which has not been previously recorded from Madras, was widely distributed, but less common than *P. argentipes* ; it was found in both houses and stables. *P. minutus*, Rond., was taken in the more densely populated parts of the town, and occurred in some numbers in one or two places. A few specimens of *P. squamipleuris*, Newst., were caught in the same situations as *P. minutus*.

NAPIER (L. E.). **An Epidemiological Consideration of the Transmission of Kala-azar in India.**—*Indian Med. Res. Memoirs*, no. 4, pp. 219–265, 6 maps, 4 figs., 18 refs. Calcutta, February 1926.

The author discusses the factors that may be concerned in the transmission and endemicity of kala-azar in relation to its known distribution, assuming nothing but that the causal organism of the disease has essential stages of its life-cycle both in the human body and outside it, although he does not consider that this is absolutely proved. It appears that various regional and climatic conditions, many of which are interdependent, are responsible for determining the distribution of the disease; all of these factors, with the exception of temperature, presumably affect the causal organism only indirectly, through their effect on its non-human host.

The range of temperature within which the flagellate stage of the parasite of kala-azar [*Leishmania donovani*] *in vitro* is viable is very wide, but the range within which development takes place is much more restricted, being between about 64° and 82·5° F.; assuming that the range within which the parasite can develop in its non-human host is the same as *in vitro*, it is probable that development cannot take place unless the temperature for the greater part of the twenty-four hours is within this range, and that the more temperate climate of Bengal and Assam, as compared with most other parts of India, is essential for the endemicity of kala-azar. It is also possible that the period of even temperature in July, August and September in these areas plays an important part in the transmission of the disease. In view of the above it is not possible to exclude an insect from a list of possible transmitters on the ground that it flourishes under conditions unfavourable to the transmission of the disease, unless these conditions coincide with temperature favourable to it. Other temperature conditions that appear to be essential to the endemicity of kala-azar are a monthly mean maximum and minimum below 100° and above 45° F., respectively, and an annual diurnal range less than 20° F.

Apart from temperature the conditions favourable to the transmitter of the disease, being those usually obtaining where it is endemic, include the following: An altitude of less than 2,000 ft. above sea-level, a heavy annual rainfall (50 inches or more), alluvial soil, an annual mean relative humidity of at least 70 per cent., and a relative humidity that rarely falls below 80 per cent. for at least three months in the year, a high subsoil water-level maintained throughout the year, abundant vegetation, and, in general, rural districts rather than towns. In towns the conditions usually associated with kala-azar are unprotected earth, vegetation near the dwelling, ground-floor residences, thick-walled masonry houses and accumulations of refuse, particularly when connected with the keeping of fowls or ducks. Moreover, the transmitter of the disease must be one that has a breeding ground connected with a definite site in or near a dwelling, probably with soil (as the destruction of the dwelling still leaves the site infected), has a short range of activity (less than 300 yards), has a long life or is capable of transmitting infection to its progeny, is capable of steady extension of range under exceptionally favourable circumstances, and in the absence of natural barriers, although not readily establishing itself on a new site, does not ordinarily travel on man or in his belongings, is freely associated with man, and is very prevalent during the monsoon months.

Various Nematodes and Arthropods are discussed with regard to the possibility of their being intermediate hosts and vectors of *L. donovani*, and all, with the exception of *Culicoides* spp. and *Phlebotomus* spp., are, for one or more reasons, eliminated. Every epidemiological observation is in keeping with the theory that the insect concerned is *P. argentipes*, and its bionomics also fulfil the necessary conditions, except that it is short-lived ; it is possible, however, that infection may be transmissible to the larva of the next generation.

MICHAEL (D. F.). **A Study of the Incidence of Kala-azar in certain Parts of North Behar.**—*Indian Med. Res. Memoirs*, no. 4, pp. 277–286, 2 pls., 4 charts. Calcutta, February 1926.

Kala-azar is endemic in an area within about fifteen miles of Pusa' North Behar, and although this does not seem to have been realised until the last few years, the author has obtained evidence of its occurrence in 1908, and he suggests that it may be at present unrecognised in other parts of the Province. The incidence of the disease in two villages that appear to be definitive foci of infection is discussed. Lack of conservancy, defects in domestic and personal hygiene, and the presence of dirt in and around houses, are apparently definitely connected with its prevalence. The institution of hygienic measures in an infected area, combined with the treatment of cases of the disease, seems to lessen the incidence in a striking manner. The disease is most prevalent when humidity is relatively high, and markedly less so during dry weather.

CHRISTOPHERS (S. R.) & BARRAUD (P. J.). **The Development of the Male and Female Hypopygium of** *Phlebotomus*.—*Indian Jl. Med. Res.*, xiii, no. 4, pp. 853–870, 4 pls., 12 refs. Calcutta, April 1926.

The contents of this paper are indicated by its title.

CHRISTOPHERS (S. R.). *A.* (*Myzomyia*) *pattoni*, **a new** *Anopheles* **from Shan-tung, North China ; with Notes on some other Species of** *Anopheles* **from the same Locality.**—*Indian Jl. Med. Res.*, xiii, no. 4, pp. 871–877, 1 pl., 4 refs. Calcutta, April 1926.

The male and female of *Anopheles* (*Myzomyia*) *pattoni*, sp. n., are described from North China ; other species dealt with are *A. lindesayi* var. *japonicus*, Yamada, and *A. hyrcanus* var. *sinensis*, Wied., the systematic position of which is discussed.

SHORTT (H. E.), BARRAUD (P. J.) & CRAIGHEAD (A. C.). **An Account of Methods employed in Feeding and Re-feeding Sandflies,** *Phlebotomus argentipes*, **for the second and third Time, on Man and Animals.**—*Indian Jl. Med. Res.*, xiii, no. 4, pp. 923–942, 1 pl., 4 refs. Calcutta, April 1926.

In previous investigations, the death of practically all the fed *Phlebotomus argentipes* on the fourth and fifth days after experimental feeding presented an apparently insuperable barrier to the investigation of the later stages in the life-history of the flagellate, *Leishmania* (*Herpetomonas*) *donovani*.

Methods are now described by which the flies may be kept alive and re-fed, the authors' conclusions being as follows: The main factors in inducing oviposition with continued life of the fly, in *P. argentipes* bred in captivity, are a temperature of 28° C. [82·4° F.] with upward and downward variations of not more than 1–2° C. [1·8–3·6° F.] and an accurate adjustment of the degree of humidity. These factors are operative mainly during the season of the year when natural breeding of sandflies is actively in progress. *P. argentipes* is known to feed in nature on man, cattle and goats, and in captivity can be induced to feed in addition on mice, monkeys and rabbits, for a second and third time.

When the flies are fed on kala-azar cases, the most favourable condition as regards the second feed for the production of a very heavy infection with flagellates is that it should be either on the same kala-azar case as the first feed or on an animal.

Shortt (H. E.), Barraud (P. J.) & Craighead (A. C.). **The Life-history and Morphology of** *Herpetomonas donovani* **in the Sandfly** *Phlebotomus argentipes*.—*Indian Jl. Med. Res.*, xiii, no. 4, pp. 947–959, 5 pls., 1 fig., 6 refs. Calcutta, April 1926.

Previous descriptions of the forms of *Leishmania* (*Herpetomonas*) *donovani* occurring in *Phlebotomus argentipes* [*R.A.E.*, B, xiii, 30, 79; xiv, 11] have been limited to the appearances seen in the first five days after feeding; recently, however, the authors have succeeded in keeping sandflies alive up to at least twelve days after their original feed [see preceding paper], and are consequently able to describe the development of the parasite during that time as observed in flies kept at a temperature not varying more than 1° C. [1·8° F.] above or below 28° C. [82·4° F.].

Examination of the gut contents of a sandfly twenty-four hours after an infective feed reveals no Herpetomonads; the immobile forms that may be seen in a stained preparation of the blood-mass at this time are either apparently unaltered Leishman-Donovan bodies or other aflagellate forms; these forms are indistinguishable in the fresh gut contents, consisting of undigested or only partially digested blood.

After two days, sluggishly motile flagellate forms and division forms are seen in fresh preparations of the gut contents. In dissections made after three days, elongated free-swimming flagellates are in evidence for the first time, and multiplication is very active, there being a large number of dividing or recently divided forms. The free-swimming elongate flagellates appear to possess intense vital activity capable of carrying them into any situation penetrable by bodies of their bulk. By the third day there are present in the gut of the fly, although in comparatively small numbers, most of the stages of the flagellate that are seen up to the eighth or ninth day. From the third day after the initial feed the multiplication of the flagellates is intensely active, so that by the fourth or fifth day the gut of the fly is a seething mass of active flagellates, which have a tendency to concentrate in the anterior part of the midgut. Large masses of elongate flagellates in the form of rosettes or agglomerations of rosettes may occur. Free-swimming flagellates may ascend the malpighian tubules and the diverticulum, and may occur in comparatively large

numbers in the intestine, as far as the anal opening. Masses of flagellates in palisade formation, often many layers deep, occupy the narrow anterior part of the midgut and the posterior margin of the proventricular fold, almost blocking the lumen of the gut. By the fourth or fifth day, the fly has laid its first batch of eggs and is ready for a second feed.

Although the fly's second meal cannot be said to have no effect on the flagellates present in the midgut, the majority survive and there is no substantial check in the progressive increase towards the maximum development of the infection that is reached on the seventh or eighth day. The massive infection in the anterior end of the midgut extends to the pharynx, in which it continues to spread anteriorly; throughout this development elongate free-swimming flagellates are set free from the anterior edge of the mass; the authors suggest that these forms may either be themselves the infective ones or develop into them without further sub-division. The authors have not so far found the massive growth of flagellates to extend beyond the anterior end of the pharynx, which is reached by the seventh or eighth day after the first feed, and the second to fourth day after the second feed, although free forms occur at the anterior end of the buccal cavity; flies examined up to the twelfth day and after four feeds have shown no advance on this condition.

It is considered that the conditions present in the gut of the sandfly are identical, in so far as the different environment permits, as regards the inter-relationship between the flagellates and the gut as a whole, with those obtaining in artificial cultures in NNN medium, and that the course of events in artificial cultures of *L. donovani* in that medium is an accurate recapitulation of the natural course of development in *P. argentipes*.

The life-history of *L. donovani*, which the authors consider to be a true *Herpetomonas*, in *P. argentipes*, is compared with that of *H. ctenocephali*, which is parasitic in *Ctenocephalus canis*, and has similar morphological characters. The larva of *C. canis* ingests the supposed cystic forms of *H. ctenocephali*, and an intense multiplication of flagellate forms occurs in its midgut; in the adult *C. canis* the midgut is usually almost free from parasites, as the infection has spread posteriorly, and flagellates are concentrated in the intestine and rectum, where the supposed cystic forms develop that are voided in the excreta. The development of *L. donovani* in *P. argentipes* is very similar except that infection progresses anteriorly, and no cystic forms have yet been detected in the mouth-parts, although such forms have been produced in artificial cultures. At the same time, the supposed cystic infective forms of *H. ctenocephali* and other insect Herpetomonads are presumably forms evolved to resist desiccation in the extra-corporeal stage, while *L. donovani*, if transmitted by the bite of *P. argentipes*, would not be subjected to desiccation, so that the cystic forms would appear not to be essential.

The work of the authors has shown that even in the most heavily infected sandflies flagellates do not occur anteriorly to the pharynx by the fifth day, while they do not occur in the buccal cavity until after the second feed, when, however, free flagellates are present as far forwards as the commencement of the biting mouth-parts, and it would seem unavoidable that some should find their way into the wound at the third feed. Until the mechanism of the action of the mouth-parts of the sandfly in the act of biting is more precisely known it cannot be decided

whether it is possible for the parasites present in the pharynx to be transferred to the wound.

Another question that has not been definitely settled is whether it is possible for *L. donovani* to pass from one insect to another without an intermediate vertebrate host. Evidence so far obtained is against the possibility of this occurring. Sandfly larvae fed repeatedly from an early stage on old cultures of *L. donovani* containing large numbers of supposed cystic forms [*R.A.E.*, B, xiv, 138] failed to develop an infection with flagellates, and no massive infection of flagellates has been observed in the intestine or rectum of adult sandflies, nor have cystic forms been observed there.

SHORTT (H. E.), BARRAUD (P. J.) & SWAMINATH (C. S.). **Further Observations on the Breeding of** *Phlebotomus argentipes* **in Assam.** —*Indian Jl. Med. Res.*, xiii, no. 4, pp. 943–946, 1 ref. Calcutta, April 1926.

As a result of adopting certain improvements in the method of breeding *Phlebotomus argentipes* previously described [*R.A.E.*, B, xiv, 139], some thousands of adult sandflies were reared from eggs in the latter part of 1925. The improvements adopted are here described. When the females are dead, the filter paper bearing the eggs and food material is transferred to a shallow porous earthenware saucer, about 4½ inches in diameter, which is placed in an open petri dish containing water ; a fresh supply of food is added to that originally present, and the saucer is covered with an earthenware lid.

The goat and rabbit faeces used as food material are thoroughly baked and pounded in a mortar, and afterwards kept in a stoppered bottle until required ; the food material actually placed in the saucer contains, in addition, 1 part of dried and powdered rabbit's blood to 12–15 parts of dried faeces ; this material quickly takes up moisture from the saucer and forms an ideal food for the larvae.

The saucers are kept sufficiently moist by pouring water into the petri dishes containing them ; fresh food is added as required. Should there be an excessive growth of mould it is covered with a layer of food to which the larvae soon migrate. The larvae pupate in the food material, round the edges of the saucer, or under the filter paper, where there is a considerable degree of moisture. Dryness is the one condition to be avoided from the time that the eggs are laid to the time that the adults emerge.

As soon as the larvae begin to pupate, the lid of the saucer is removed and the latter, in its petri dish, is placed in a muslin cage in which the flies emerge. The removal of individual pupae to test tubes has no detrimental effect, and is necessary if it is desired to obtain unfertilised females.

A large percentage of bred sandflies have been found to be infected with Gregarines, and, as it was thought that this might have an adverse effect on their feeding and length of life, an attempt was made to prevent the infection by removing the dead bodies of the female flies from the laying jars and transferring the young larvae to fresh food. The adults bred from these larvae were nearly all infected with Gregarines as before, but the infection did not appear to affect either their feeding or length of life in confinement.

All larvae and pupae were kept at room temperature until the end of November, when some saucers were transferred to an incubator.

In August the room temperature ranged from 27° to 32° C. [80·6° to 89·6° F.] ; during September and October it fell gradually, then more rapidly in November, towards the end of which month it sometimes fell as low as 16° C. [60·8° F.], while maximum day temperature was 24° C. [75·2° F.]. The larvae appeared to thrive best in August, when the complete life-cycle occupied about a month or slightly less ; at lower temperatures the life-cycle occupied from six weeks to two months or even longer. Towards the end of October fewer eggs were laid by the flies in the jars, but the number increased slightly when the jars were placed in an incubator, possibly, however, because it was dark there.

In most batches of flies a proportion of the females died without laying ; eggs sometimes fail to hatch, and numbers of larvae die, especially in the early stages, from unknown causes. In the twelve most successful batches the average number of flies bred from each female placed in the laying jar ranged from 3·8 to 9·2. In one case 260 adults were reared from 277 larvae transferred to fresh food soon after they had hatched from the eggs.

Young (T. C. M.), Richmond (A. E.) & Brendish (G. R.). **Sandflies and Sandfly Fever in the Peshawar District.**—*Indian Jl. Med. Res.*, xiii, no. 4, pp. 961–1021, 5 pls., 9 charts, 1 map, 23 refs. Calcutta, April 1926.

This study of the incidence and aetiology of sandfly fever and the bionomics of *Phlebotomus papatasii*, Scop., was made at Peshawar and Landikotal, two garrison towns in the North West Frontier Province of India. At Landikotal sandfly fever is much more prevalent than at Peshawar, and the epidemics usually reach their height in June or July, but sometimes earlier ; the intensity of the seasonal incidence appears to be in direct relation to the rainfall. In 1921, a year of exceptional drought and prematurely high temperatures, the epidemic was at its height in April, and had subsided by June.

Large numbers of female *P. papatasii* caught in barrack rooms and in cavities in banks that were subsequently found to be close to the breeding-grounds were dissected and examined for the development of the egg follicles and the state of the gut contents, in order to attempt to determine the age of the flies, by the method used by Christophers with Anophelines [*Paludism*, no. 2, p. 73 ; Simla, 1911]. The details of these examinations are given. Subsequently, bred sandflies were similarly examined at various times before and after feeding, so that it was possible to assign an approximate age to the flies in which the different characters had been observed. As a result of these examinations it was found that the female flies wait for some hours after emergence for the chitin of their bodies to harden, and that if day breaks before the hardening is complete they shelter close to the breeding-place during the day ; at night they fly to human habitations, where fertilisation probably takes place, and then feed within 36 hours of emergence. One feed only is taken at this time, and in from 60 to 84 hours from emergence the flies return to the breeding-ground, where the eggs are laid in from 108 to 120 hours. After oviposition, a second blood meal may be taken, and a second batch of eggs may be laid after a similar interval.

In order to discover the breeding-places of *P. papatasii* collections of soil and refuse from various places were examined for the presence

of larvae by means of an apparatus similar to that described by Morris [*R.A.E.*, A, x, 527]. The soil was washed through three sieves and the water and fine particles of soil passed through fine copper gauze (40 strands per linear inch) and finally through muslin ; the material retained by the copper gauze and by the muslin was placed in a dish of water and thoroughly agitated, so that the larvae, if present, sank to the bottom, while lighter matter floated. The floating débris was then poured off and a saturated solution of white sugar added to the residue, which was thoroughly stirred and allowed to settle, with the result that in a few minutes any larvae present were seen floating on the top of the solution. Later, instead of pouring off the water and floating material from a shallow dish before adding the sugar solution a deeper vessel was used and the floating material was skimmed off and the water removed by siphoning, as it was found that larvae were liable to be poured off with the water by the first method. In addition to larvae of *P. papatasii*, those of other Psychodids were recovered by this method, as were also eggs, but not pupae.

Details are given of the nature of the ground from which a large number of samples were taken for examination. The earth of the samples in which larvae of *P. papatasii* were found was neither of the consistency of mud nor very dry ; larvae were never present in earth soaked with urine or containing human excrement, nor in manure or other refuse lying in the open. In each case in which larvae were found the soil consisted of moist earth and vegetable débris from deep cracks in broken ground, not more than 80 yards from the barracks or mule lines. The larvae feed on finely-divided organic matter and pupate in the drier upper soil, probably near the surface.

P. papatasii was bred satisfactorily by the method used by Smith for breeding *P. argentipes*, Ann. & Brun. [*R.A.E.*, B, xiii, 122], but it was found unnecessary to keep the fed females in tubes and not in the breeding jar until the blood meal was digested. With flies bred by this method at room temperature between April and July the average length of the egg stage was 12 days, larval stage 21 days, and pupal stage 7 days. Subsequently an abundant supply of *P. papatasii* was obtained by confining females in a muslin cage containing an earthenware pot filled with a mixture of mule litter and earth covered with a layer of clay in which cracks had been formed, the pot being placed in a shallow tin containing water. When the flies died, after ovipositing, all, with one exception, died in the cage and not in the pot ; the one dead fly that was seen at the bottom of one of the cracks in the clay was not eaten by the larvae ; it therefore seems very unlikely that sandfly fever infection is acquired by the larvae in eating the dead adults or their excreta.

Attempts to discover the causal organism of sandfly fever in the blood of patients and in flies fed on them failed to confirm Whittingham's findings [*R.A.E.*, B, xi, 60], and attempts to inoculate the disease into guineapigs failed, but in three flies that were kept alive for six days after feeding on a patient certain organisms were found in the mouth-parts, thorax, or abdomen that were not seen in any control flies. The authors consider that the possibility of the causal organism being a *Leptospira* should be investigated further, and suggest that, as Hindle has shown that *Leptospira* may exist in drinking water, sandfly larvae might become infected with these organisms in the breeding-grounds [*cf. R.A.E.*, B, xii, 24] ; they also suggest the possibility that mites, two species of which were found to occur as

ectoparasites of sandflies [see next paper], may act as vectors of the disease among the sandflies. They consider that sandfly fever is a distinct disease entity, although very variable in its manifestations.

As measures against *P. papatasii* in buildings or tents, fumigation and the use of repellents are too costly for any but extremely limited application. Sulphur fumigation was not effective, using ½ lb. crude sulphur per 1,000 cubic feet, nor was fumigation with formaldehyde, using approximately 2 oz. formalin and 1 oz. potassium permanganate per 1,000 cubic feet. A mosquito net sprayed with about 1 oz. of a solution of block camphor, 3 parts, in citronella oil, 10 parts, or a muslin house net on a frame over a bed gives protection to the occupant; in the latter case ventilation is assured by placing an electric fan within the net.

The predominant sandfly in the Peshawar district is *P. papatasii*. *P. minutus*, Rond., appears later and is commonest in July, when the incidence of sandfly fever is low, and no evidence was obtained to indicate that it feeds on man; numbers of this species were found in cavities in the earth where frogs were sheltering. *P. minutus* var. *antennatus*, Newst., and *P. squamipleuris*, Newst., were taken at Peshawar; the latter appears to frequent gardens, and was taken at light traps. *P. sergenti*, Parrot, was taken at Landikotal, where canine leishmaniasis is known to have occurred, and also probably oriental sore. With the exception of *P. minutus* and *P. squamipleuris* sandflies do not appear to be attracted to light traps; no *P. papatasii* were captured by means of them, but large numbers of a species of *Culicoides* superficially resembling it were taken on a lamp globe smeared with vaseline.

Methods of controlling *P. papatasii* are discussed. It is considered that the simplest would be for men to be employed to remove or cover up with earth all temporary accumulations of organic débris in the neighbourhood of the camps, particularly after rain, which, by washing out the loose soil forms suitable places for the accumulation of refuse and for breeding. It would also be of use for individual householders to make a thorough inspection of their gardens and compounds once a month in order to discover breeding-places of *P. papatasii*. Special attention should be paid to the sides of irrigation channels, where refuse may be deposited above the normal water-level.

HIRST (S.). **Report on the Acari found on or associated with Sandflies in India.**—*Indian Jl. Med. Res.*, xiii, no. 4, pp. 1023–1026, 3 figs. Calcutta, April 1926.

This is an addendum to the preceding paper. *Raphignathus youngi*, sp. n., and *Trombidium hindustanicum*, sp. n., taken on sandflies [*Phlebotomus papatasii*] at Peshawar, are described, the former from adults and the latter from larvae.

NITZULESCU (V.). **Sur le *Leptomonas* sp., parasite de l'intestin de *Notonecta glauca* L., en Roumanie.**—*C.R. Soc. Biol.*, xcv, no. 21, pp. 124–125, 2 refs. Paris, 18th June 1926.

The species of *Herpetomonas* (*Leptomonas*), originally recorded by Zotta from Rumania in *Notonecta glauca*, L., is described but not specifically determined.

WAGNER (J.). **Zwei neue palaearktische Floh-Arten.** [Two new Palaearctic Species of Fleas.]—*Konowia*, v, no. 1, pp. 79–84, 5 figs. Vienna, 10th June 1926.

The fleas described are *Stenoponia conspecta*, sp. n., on *Gerbillus opimus* in Turkestan, and *Neopsylla democratica*, sp. n., on *Microtus slovzovi*, *Lagurus lagurus* and other hosts in Siberia.

[ZAKHAROV (L. Z.).] **Захаров (Л. З.). On the Question of controlling Ticks, Transmitters of Piroplasmosis.** [*In Russian.*]—*Bull. N. Caucasian Plant Prot. Sta.*, no. 1, pp. 53–59, 9 refs. Rostov-on-Don, 1926.

The ticks transmitting piroplasmosis in North Caucasus are *Dermacentor reticulatus*, F., on horses, cattle and sheep ; *Hyalomma aegyptium*, L., on cattle and camels ; *Haemaphysalis cinnabarina punctata*, C. & F., on domestic animals and man ; *H. iberica*, on goats ; *Ixodes ricinus*, L., on cattle, goats and dogs ; *Rhipicephalus sanguineus*, Latr., on dogs ; *R. bursa*, C. & F., on cattle and sheep ; and *Boophilus annulatus calcaratus*, Neum., on cattle and buffalos.

The various methods of destroying ticks in pastures and on the animals are reviewed.

MILLAR (W. M. C.). **Some Observations upon Blowfly Maggots.**—*Scot. Nat.*, no. 158, pp. 49–52. Edinburgh, 1926.

A trap suggested for blowflies troublesome to sheep, such as *Lucilia sericata*, Mg., *Calliphora erythrocephala*, Mg., and *Sarcophaga carnaria*, L., consists of the carcase of a dead animal or bird, slit open and hung in a pasture near trees and water, over a pail containing 2–3 lb. quicklime, lime and flowers of sulphur, or dry slaked lime. The flies lay their eggs on the carcase and the larvae fall into the lime and are destroyed. The traps should be visited daily and the contents of the pails stirred with a stick. By this means as many as 800–1,000 maggots have been taken from a rabbit or a fowl in 12 days.

[AUSTRALIA.] **Regulations under the Quarantine Act, 1908-1924.** Statutory Rules, no. 57, 2 pp. Melbourne, 29th April 1926.

Quarantine Regulations 1922 [*R.A.E.*, B, xii, 22] are amended as regards methods of destroying noxious insects, etc., on vessels arriving in Australian ports.

BOTSFORD (R. C.). **Mosquito Control Work in Connecticut. Season of 1925.**—*Connecticut Agric. Expt. Sta.*, Bull. 275, pp. 315–321, 3 pls. New Haven, Conn., February 1926.

Particulars are given of the anti-mosquito work carried out during the year in the various towns of Connecticut against the four groups, known as the salt marsh, fresh water swamp, malaria and rain barrel mosquitos. A table shows approximately the present condition of the salt marsh areas in Connecticut.

STRICKLAND (C.). **A Short Key to both Sexes of the Anopheline Species of India, Ceylon and Malaya.**—19 pp., 4 pls., 22 figs. Calcutta and Simla, Thacker, Spink & Co., 1925. Price *Re.* 1-12. [Recd. June 1926.]

This key is based on the characters of the wing or hind leg, which are considered to be distinctive in most Indian and Malayan mosquitos ; in a few cases where the determination is uncertain, reference is made to other structures. This system is considered simpler than that represented by the ordinary dichotomous key. Christopher's list of valid Indian species [*R.A.E.*, B, xiii, 109] has been taken as the basis of selection for the key. In all, 21 species are dealt with, with some of their better-known synonyms.

CROSS (H. E.). **Bot Flies of the Punjab.**—*Agric. Res. Inst., Pusa*, Bull. 160 (1925) 16 pp., 8 pls. Calcutta, 1926.

Cattle throughout the Punjab are infested with warble flies (*Hypoderma*), but in goats the infestation is principally confined to those kept in hilly areas. Of 41,861 head of cattle examined in one year, 11,593 were infested, while goats were infested to the extent of from 40 to 90 per cent.

The species dealt with are *Hypoderma crossi* in goats ; *H. lineatum* in cattle, the larvae of which live in the subcutaneous tissues ; *Cephalopsis titillator*, in camels ; *Cephalomyia* (*Oestrus*) *ovis* in sheep and apparently also in goats ; and a new species figured and described, but not named, in wild sheep. All these are parasites of the nasal cavities *Oestrus* (*Gastrophilus*) *intestinalis* (*equi*) infests the alimentary canal in horses.

The effects resulting from infestation by these flies are described, and the usual remedies adopted in other countries are discussed for the benefit of breeders in India who take no steps to counteract the losses caused by them. In the case of camels, little damage seems to be caused by bot-flies, though they may be a cause of pus in the sinuses which is a common disease of camels and responsible for many deaths.

EHIK (G.) & DUDICH (E.). **A magyarországi emlosök és azok külso rovarélosködóinek határozó táblái.** [The Mammals of Hungary with Keys to the Insects parasitic on them.]—pp. 1–74, 6 figs. Budapest, Hung. Nat. Mus., 1924. [Recd. August 1926.]

In the second part of this work on Hungarian mammals, Dr. Dudich deals with the parasitic insects found on them. An account of the ticks has been published separately [*R.A.E.*, B, ix, 116 ; xi, 87].

[SHAKHOV (S. D.).] **Шахов (С. Д.). The Yellow Fever Mosquito *Aëdes argenteus* Poir. (*calopus*, Mg.) according to Observations of the Entomological Expedition in Abkhasia.** [*In Russian.*]—*Rev. Microbiol. & Epidemiol.*, v, no. 1–2, pp. 33–42, 5 figs., 5 refs. Saratov, 1926. (With a Summary in English p. 107.)

The distribution of *Aëdes argenteus*, Poir., has generally been considered to lie between latitudes 40° N. and 40° S., but it is now recorded from Sukhum (Georgia) as far north as 43°. All the stages are described,

and an account is given of the biology as occurring under local conditions. The larvae have never been found in pools, breeding occurring mainly in rain-water butts. The adults were only found in dwellings.

[Shtakel'berg (A. A.).] **Штакельберг (А. А.). Materials for the Identification of Blood-sucking Diptera of U.S.S.R. 2. Keys to the Families and Genera from the Adult Stage.** [*In Russian.*] —*Rev. Microbiol. & Epidemiol.*, v, no. 1–2, pp. 43–56, 1 pl., 7 figs. Saratov, 1926.

These keys deal with the Diptera-Nematocera and serve as an introduction to keys to the species of the various genera, of which that to the genus *Anopheles* has already been noticed [*R.A.E.*, B, xiii, 166]. *Baikalomyia*, n. n., is suggested for the Tabanid genus, *Baikalia*, Surc., this name being preoccupied in Mollusca.

[Wagner (J. N.) & Ioff (I. G.).] **Вагнер (Ю. Н.) и Иофф (И. Г.). Materials for a Study of the Ectoparasite Fauna in the South-east of Russia.** [*In Russian.*]—*Rev. Microbiol. & Epidemiol.*, v, no. 1–2, pp. 57–100, 1 pl., 22 figs. Saratov, 1926. (With a Summary in German pp. 108–123.)

This paper deals with the fleas found on various species of *Citellus*, *Alactaga* and allied rodents; two earlier parts and a summary of the whole have already been noticed [*R.A.E.*, B, xiv, 67, 99].

The fleas dealt with are: *Ceratophyllus tesquorum*, Wagn., in the Volga region (as well as its subspecies in Siberia and China); *C. simplex*, Wagn. (*danubianus*, Roths.) in the Ukraine and Rumania; *C. martinoi*, sp. n., in Yugoslavia; *C. trispinus*, sp. n., in Western Turkestan; *C. dacus*, J. & R., for which the new genus *Rostropsylla* is erected, in Transcaspia and Transcaucasia; *Ctenophthalmus pollex*, sp. n., and *C. breviatus*, sp. n., in the Volga region; *C. orientalis*, Wagn., in the Ukraine and Jugoslavia; *C. arvalis*, sp. n., in Siberia; *Neopsylla setosa*, Wagn. (*spinea*, Roths.) (which is considered distinct from *N. bidentatiformis*, Wagn., described from rats in the Crimea), from the Volga region; *Frontopsylla semura*, gen. et sp. n., from the Volga region (in this genus are also included *Ceratophyllus elatus*, J. & R. [*R.A.E.*, B, iv, 32] (type) and *C. luculentus*, J. & R.); *Oropsylla ilovaiskii*, gen. et sp. n. (this genus also including *Ceratophyllus silantiewi*, Wagn. (type)), and *C.* (*Ophthalmopsylla*) *volgensis*, subgen. et sp. n., from the Volga region; and *Mesopsylla tuschkan*, sp. n., and *M. eucta dampfi*, subsp. n., from South Russia.

[Vuishelesskaya (N. S.) & Parfent'ev (I. A.).] **Вышелесская (Н. С.) и Парфентьев (И. А.). On the Method of Controlling Mosquitos.** [*In Russian.*]—*Défense des Plantes*, iii, no. 1, p. 97. Leningrad, March 1926. [Recd. July 1926.]

In experiments with nicotine to destroy mosquitos in their hibernating quarters, such as cellars, the results show that the lethal dose both for Anophelines and Culicines varies between 8 gms. per cu. m. at an exposure of 5 minutes and 0·5 gms. at an exposure of 16 hours.

[Gal'kov (V. P.).] **Гальков (В. П.). An Experiment with Hydrocyanic Acid for the Control of Insect Parasites in Dwellings.** [*In Russian.*]—*Défense des Plantes*, iii, no. 1, pp. 98–100. Leningrad, March 1926. [Recd. July 1926.]

The experiments described were made in workmen's dwellings in the Ural, the rooms of which were heavily infested with cockroaches and bed-bugs [*Cimex*], every available crack being filled with them. The cockroaches attacked man, even adults when asleep, while small babies were covered with sores from their bites.

The rooms were entirely cleared of these pests by fumigating with hydrocyanic acid gas at the rate of about $\frac{1}{3}$ oz. sodium cyanide, 5 oz. sulphuric acid, and 8 oz. water to 340 cu. ft., the dose being varied according to the severity of the infestation and the possibility of making the structure airtight.

Campos (F.). **Estudios biológicos sobre los mosquitos de Guayaquil y alrededores.** [Biological Studies on the Mosquitos of Guayaquil and its Environs.]—*Rev. Col. Nac. Vicente Rocafuerte*, vii, no. 21–22, pp. 3–49, 8 pls. Guayaquil, September–December 1925. [Recd. June 1926.]

During a year's mosquito survey at and around Guayaquil, Ecuador, 32 species were found. A brief description is given of each, with details of the breeding-places, months of prevalence and biology. *Aëdes argenteus*, Poir. (*Stegomyia fasciata*, F.) has a development in Ecuador very similar to that in Brazil. It occurs throughout the year and is typically domestic, being generally found in cisterns, etc., containing clear water. Oviposition takes place at night and is normally completed on one occasion. The egg stage lasts 3–4 days, the larval stage about 14 in the laboratory and probably less than 10 in nature, and the pupal stage 47–48 hours. The adult life varies from 30 to 80 days. Honey prolongs life in both sexes, but blood shortens that of the female. Blood is absolutely essential for the production of eggs.

A key is given to the five Anophelines observed. *Anopheles tarsimaculatus*, Goeldi, is the chief species throughout the year. It is not particular as to breeding-places and occurs also in tree-holes. It principally attacks man at twilight or by night. The larval stage appears to be relatively long, and many larvae failed to pupate in 15–30 days. *A. pseudopunctipennis*, Theo., breeds chiefly outside Guayaquil and rarely in the city itself. It occurs in December and January. *A. punctimacula*, D. & K., is a bush species ; it is uncommon, and the larvae inhabit stagnant waters. It was taken in June and July. *A. mediopunctatus*, Theo., is another bush species of which a few adults were captured in shady places. It is possibly identical with the preceding and was taken in June. *A. hylephilus*, D. & K., is rare ; it breeds in Bromeliaceae.

An appendix contains a few notes on aquatic insects that prey upon mosquito larvae in Ecuador.

Masi (L.). **Nuova specie di *Chalcis* della Cirenaica.**—*Boll. Lab. Zool. gen. agrar. R. Scuola sup. Agric.*, xviii, pp. 300–304, 1 fig. Portici [1926].

Chalcis libyca, sp. n., is described from the pupae of a Sarcophagid fly, *Wohlfahrtia argentifrons*, Schin., in Cyrenaica.

Musconi (L.). **L'accrescimento delle larve di mosca** (*Calliphora eritrocephala*) **in rapporto con la temperatura e l'alimentazione.** [The Growth of Fly Larvae (*C. erythrocephala*) in Relation to Temperature and Food.]—*Boll. Lab. Zool. gen. agrar. R. Scuola sup. Agric.*, xviii, pp. 95–115, 8 figs., 18 refs. Portici, 1925. [Recd. July 1926.]

Larvae of *Calliphora erythrocephala* are able to live and grow between a minimum temperature of 4°–5° C. [39·2°–41° F.] and a maximum of 40°–41° C. [104°–105·8° F.]. At 0° C. [32° F.] the eggs do not develop, but are not killed and hatch if placed in a higher temperature after 3–4 days. It is possible to stop the feeding of a larva before it reaches natural size, and this does not prevent pupation. The limit of size varies with the temperature. By increasing the temperature the limit reached very closely approximates to the length that the larva would have attained if it had not been deprived of food. At a high temperature the larva eats only spontaneously for the necessary time, but at low ones it eats more than is needed for pupation. The resulting adult is smaller the higher the temperature.

Kono (H.). **On Insects used for Food and Medicine in the Vicinity of Shimauchi-Mura, Nagano-Ken.** [*In Japanese.*]—*Insect World*, xxx, pp. 191–198. Gifu, June 1926.

Among the insects used for food in the mountainous region in question are : Odonata, the nymphs of *Sympetrum* spp. ; Plecoptera, *Perla* and *Acroneuria* ; Trichoptera, larvae of *Stenopsyche* ; *Oxya* and other Orthoptera ; Lepidoptera, the pupae of *Bombyx mori*, L. ; Coleoptera, the adults of *Cybister* ; Hymenoptera, various stages of *Vespa japonica*, Sauss., the latter being so important that it is canned and has become an article of commerce.

Among the insects used for medicine are the eggs of *Mantis*, larvae of the Sialid, *Protohermes grandis*, Thunb., the Hepialid, *Phassus excrescens*, Butl., and the Cerambycid, *Melanauster* sp., and adults of *Luciola* spp., etc.

Herrmann (O.), Kolossow (J.) [Kolosov (Yu.)] & Lipin (N.). **Parisergrün als** *Anopheles*-**Larvizid.** [Paris Green as a Larvicide for *Anopheles*.]—*Centralbl. Bakt. Paras. Infekt.*, Ite Abt. Orig., xcviii, no. 7–8, pp. 547–552. Jena, 7th June 1926.

Laboratory experiments were made with mixtures of Paris green and road dust, 1 to 100–200, and of Paris green and powdered clay, 1 to 100–2,000, at the rate of about 170 grains per 10 sq. feet of water surface. The results show that this poison cannot normally replace petroleum, as the latter acts quickly, is reasonably cheap and is convenient and harmless in use. Paris green may perhaps be used for breeding-places used by cattle for drinking, but large-scale experiments are required to test its harmlessness. In the field, mixtures of Paris green and powdered clay, 1 to 100–1,000, only killed the larvae after a few days, and pupae (which appeared to be unaffected by the poison) developed from the more mature larvae.

K 3054) Wt P5/35 1,500 9/26 H & Sp Gp 52

Wurm (H.). **Ueber eine Milbenerkrankung der Lunge bei** *Macacus rhesus*. [On a pulmonary Disease in *M. rhesus* due to Mites.]—*Centralbl. Bakt. Paras. Infekt.*, Ite Abt. Orig., xcviii, no. 7–8, pp. 514–521, 6 figs., 5 refs. Jena, 7th June 1926.

Dissection of four individuals of *Macacus rhesus* showed an infestation of the lungs by a Dermanyssid related to *Pneumonyssus duttoni*, *P. griffithi*, *P. simicola* and *Pneumotuber macaci*, which infest the lungs of various monkeys. Infestation probably occurs through the air passages.

Fermi (C.). **Note di anofelinologia.**—*Riv. Malariologia*, v (N.S. i), no. 2, pp. 113–131, 22 refs. Rome, March–April 1926. (With a Summary in English, p. 250.) [Recd. June 1926.]

This paper consists of a number of miscellaneous notes on Anopheline larvae and their control.

Though the fish of the genus *Gambusia* do not devour insects of comparatively large size or with a hard integument, such as medium-sized Coleoptera or larvae of dragon-flies, Dytiscids or Notonectids, they feed on the larvae of Culicids and other Diptera, such as *Chironomus*, *Ephemera* and *Dixa*. In view of the fact that a surface carpet of vegetation protects Anopheline larvae from fish, raising the water-level in a tank and submerging the plants will temporarily increase the usefulness of the fish. To prevent the escape of *Gambusia* from irrigation tanks when the sluices are opened, the author is trying a device consisting of a long pipe fitting the outlet and extending across the tank close to the opposite wall. As most fish dislike swimming in dark passages or tubes and endeavour to breast a current, this arrangement may prove effective.

To test whether wind has an effect on the emergence of mosquitos, pupae of *Anopheles maculipennis* (*claviger*) and *Culex pipiens* were subjected to a stream of air from an electric fan for 3 or 4 days. In the case of the latter no difference was observed, but the effect of the breeze on *A. maculipennis* was to retard emergence at first, but not to stop it completely.

After a survey of the literature on the possibility of *A. maculipennis* living among plants growing in the open country far from dwellings and animal quarters, the author concludes that in *A. maculipennis* this does not usually occur. The exceptions are localities where large mammals and hollow trees are present, and then probably only in hot or temperate regions. If *A. maculipennis* were in the habit of living in the open, there should be sudden invasions of it indoors as a result of a marked fall in the temperature or of heavy rain, but in practice only a small increase is noticed indoors in these circumstances. At 3 miles or more from dwellings or animal quarters, the author has never found adults or larvae of *A. maculipennis*; larvae have been found at $1\frac{1}{4}$ miles.

La Face (L.). **Richerche sulla biologia del** *Culex pipiens*. **L'alimentazione e l'ibernamento.** [Researches on the Biology of *C. pipiens*. Nutrition and Hibernation.]—*Riv. Malariologia*, v (N.S. i), no. 2, pp. 132–156, 25 refs. Rome, March–April 1926. (With a Summary in English, p. 251.) [Recd. June 1926.]

In the neighbourhood of Rome hibernating individuals of *Culex pipiens* usually occur in cold, uninhabited places, though they may be

found in warmer animal quarters. In grottoes and similar places hibernating females, fat, with an empty gut and with a few eggs, may be found in the second half of September. In buildings and near animals, blood in the gut and mature eggs may be present. Facts are adduced to show that the accumulation of a reserve of fat in hibernating females is due solely to feeding on sugary liquids and not on blood. Individuals of the autumn generations refuse to bite in cold surroundings, but at 15°–19° C. [59°–66·2° F.] they readily accept blood ; this disagrees with Roubaud's statement that the autumn generations of *C. pipiens* never bite whatever the temperature may be. A rise of temperature not exceeding 30° C. [86° F.] and the presence of sufficient moisture produce in hibernating individuals a premature loss of fat, a resumption of feeding and a normal maturing of the eggs. In *C. pipiens* hibernation seems to depend on temperature and food rather than on the cyclical phenomenon of intoxication that Roubaud believes to determine winter rest independently of temperature. Captive specimens did not show any preference for a given kind of blood, and fertilisation did not influence the tendency to bite.

Moore (J. P.). **Use of Fishes for Control of Mosquitoes in northern fresh Waters of the United States. Appendix iv to the Report of the U.S. Commissioner of Fisheries for 1922.**—*U.S. Dept. Commerce, Bur. Fisheries*, Document no. 923, 60 pp., 14 photos, 30 refs. Washington, D.C., 1922.

No fish of which mosquitoes are more than an incidental item of diet have been found in the fresh waters of the north-eastern United States, but several species of small fish and the young of some larger ones native to these waters eat the larvae, pupae and eggs of mosquitos more or less habitually. Of these the most important are *Eupomotis gibbosus*, the most useful species for ponds and lakes ; *Umbra pygmaea*, for shallow or swampy areas ; and *Fundulus heteroclitus*, for fresh and brackish tidal marshes. *Gambusia affinis* has not survived the northern winters, but multiplies so rapidly that it may be used effectively against both Culicines and Anophelines in small ponds and water gardens by restocking each spring. Small goldfish are useful in fountain basins and small ponds with clean sides, and are preferable to the top minnow for use in rain-water tanks.

While in the aggregate fish destroy large numbers of all the early stages, especially of Culicines, the destruction is never complete, on account of patches of shallow water, marginal vegetation and abundance of other food for the fish.

Deeks (W. E.). **Problems in Malaria Control.**—*United Fruit Co., Med. Dept. 14th Ann. Rept. 1925*, pp. 170–186. Boston, Mass., 1926.

Deeks (W. E.). **Some Aspects of Malaria Control.**—*Jl. Trop. Med. & Hyg.*, xxix, no. 13, pp. 185–194. London, 1st July 1926.

Malaria is estimated to be the cause of about 40 per cent. of the morbidity on the plantations of the United Fruit Company in Tropical America. While it is impossible to eradicate it, it might be considerably reduced by suitable control measures, and has, in fact, already disappeared in many parts of the country where it was previously epidemic. The conditions of temperature and humidity on most of

the plantations, such as those in Honduras, are favourable throughout the year for Anopheline breeding and for the sexual development of the malarial parasite in the mosquitos. The vast majority of the employees are illiterate labourers who live under primitive conditions in unscreened houses, are frequently poorly nourished and are in many cases gamete carriers, and modern methods of mosquito control under such conditions are discussed. New camp sites should always be chosen a mile or two from breeding-places, even if it entails the conveyance of water or digging of wells. Houses should be screened, the population kept as stable as possible, and carriers should be treated until cured.

CLARK (H. C.). **A Malaria Survey of the Tela Railroad Company Farms and the Results of our Treatment of Malaria in the Farm Camps.**—*United Fruit Co., Med. Dept. 14th Ann. Rept. 1925,* pp. 187–196, 2 refs. Boston, Mass., 1926.

In this report, the recommendations for malaria control in Honduras are substantially the same as those noticed in the preceding paper. The common malaria carrier in the division surveyed is *Anopheles albimanus,* Wied.

MAYNE (B.). **Notes on the Influence of Temperature and Humidity on Oviposition and early Life of** *Anopheles.*—*Pub. Health. Repts.*, xli, no. 21, pp. 986–990. Washington, D.C., 21st May 1926.

It is known that temperature exerts a direct influence on the life activities of Anophelines, and it has been found that all stages of *Anopheles* in the southern United States are produced during the colder months. The eggs may be laid at 55° to 62° F., but not at 40° to 54° F., and hatching takes place at 66° to 70° F., but not at 58° to 59°F. There is no doubt that oviposition and hatching take place within well defined limits during the inactive season, and that the winter is not usually passed in the egg stage at temperatures found under conditions of hibernation. Experiments illustrating this fact are recorded. Low temperature apparently either inhibits oviposition or affects the hatching of deposited ova. A female that has survived the dormant season generally dies after the deposition of a few eggs, and is unable to lay its probable maximum of fertile eggs. In experiments to determine the effect of sudden changes of temperature, ten females of *A. quadrimaculatus* after subjection to temperatures of 56° to 60° F. without ovipositing, when exposed to a temperature of 63° to 64° F. for 8 hours, laid 89 eggs. These mosquitos, when returned to the cold chamber for 10 days longer, ceased to oviposit. In a further test of the effect of dessication on eggs and larvae [*cf. R.A.E.*, B, xiii, 169], eggs of *A. quadrimaculatus* when exposed to direct sunshine for periods varying from 42 hours to 16 days hatched normally, and some of them developed to maturity, and the same occurred with eggs of *A. crucians* exposed for from 10 to 21 days. These tests are of importance in planning drainage operations. Larvae hatching from these eggs were placed in containers with nothing but 3 to 4 inches of the mud used in the original cultures, and many of them developed into normal adults. It therefore seems possible for *Anopheles* to develop in the absence of food commonly regarded as essential.

LePrince (J. A.). **Destroying engorged *Anopheles* as a Malaria Control Measure.**—*Pub. Health Repts.*, xli, no. 25, pp. 1220–1226, 7 refs. Washington, D.C., 18th June 1926.

In the numerous cases in which the usual control measures against mosquitos cannot be applied, such as in certain emergency conditions or owing to the general apathy of the population as a result of poverty or other causes, excellent results may be obtained by the destruction of the engorged adults. The actual work may be carried out by children, as it is only necessary to catch and kill the mosquitos. The habits of the species concerned in a given district must be ascertained so that the adults may be killed before they leave houses, etc., for their breeding-places.

Numerous instances are quoted in which this method has been successfully applied and has proved of greater value than screening.

Coggeshall (L. T.). **Relationship of Plankton to Anopheline Larvae.**—*Amer. Jl. Hyg.*, vi, no. 4, pp. 556–569, 8 refs. Baltimore, Md., July 1926.

The experiments described in this paper were made in Georgia with the object of discovering the relation between the seasonal variation in the predominance of certain types of plankton and the occurrence of different species of *Anopheles*, with a view to treating water so as to eliminate all or certain species by destroying their food supply.

In order to show the dependence of Anopheline larvae on plankton for food, a pond containing numerous larvae of *Anopheles quadrimaculatus*, Say, and *A. crucians*, Say, was treated with a sufficient quantity of copper sulphate to destroy all the plankton, and was examined subsequently for the presence of mosquito larvae ; on the following day the number of larvae in the pond was only about half what it had been, and the alimentary tracts of these were either empty or contained remains of protozoa ; after a week only two larvae were obtained in 75 dips, but after two weeks plankton had begun to reappear and larvae were plentiful ; it is possible that some larvae were killed by the copper sulphate.

Various types of breeding-places of *A. quadrimaculatus*, *A. crucians* and *A. punctipennis*, Say, were studied, and the contents of the alimentary tracts of larvae taken from them examined. Ponds, particularly near habitations, were prolific breeding-places of *A. quadrimaculatus* and *A. crucians*, and ranged in character from those covered with a dense mat of algae and higher vegetation to those that were quite clear and contained only microscopic plankton. Running streams, which rarely contained plankton in abundance, were breeding-places of *A. punctipennis* ; in one stream that stopped running in the summer, plankton increased greatly in the pools that remained in its bed, and larvae of *A. quadrimaculatus* appeared, whereas previously only *A. punctipennis* and a few *A. crucians* larvae had been observed in it. A sunless swamp from which plankton was absent contained no Anopheline larvae, although in houses close to it adults of *A. quadrimaculatus* were abundant, having flown about half a mile from their breeding ground. In a lime sink fed by an underground stream *A. quadrimaculatus* and *A. crucians* bred while the water was high and there was no current on the surface, but in the cooler months, when the pond became a stream, *A. punctipennis* bred in it. Borrow pits do

not seem to be important as Anopheline breeding-places until they are some years old ; in the three largest pits examined, which had the heaviest growth of vegetation, *A. crucians* was breeding in moderate numbers. Wells, which contain only small amounts of suitable food for mosquito larvae, are usually the breeding-places of *A. punctipennis*, but *A. quadrimaculatus* was found breeding in one after the normal breeding-places of that species had dried up.

It is suggested that the almost complete absence of Anopheline larvae from certain potential breeding-places that contain less plankton than others in the vicinity may be due to the attraction of the odour of the latter for the female mosquito, but it is impossible to state definitely whether or not the eggs of certain species are laid in unsuitable places in which the larvae fail to mature.

Dissections of the larvae of *A. punctipennis*, *A. quadrimaculatus* and *A. crucians* showed that all three species are indiscriminate feeders and that none has a characteristic plankton food, but that the food of *A. punctipennis* is normally much less varied than that of the other two species. Larvae of *A. punctipennis* are able to subsist on a very limited plankton food supply, and the alimentary tracts of some contained only particles of clay and silica. It is suggested that the places in which *A. punctipennis* breeds throughout the season are always deficient in plankton, and that in those in which a large variety of plankton forms appears, *A. punctipennis* is replaced by *A. quadrimaculatus* ; the latter is most abundant in water containing a heavy growth of green algae, forms of which predominated in the alimentary tracts of the larvae dissected.

Dunn (L. H.). **Mosquito Control at Barranquilla, Colombia, as a Prophylaxis against Yellow Fever.**—*Amer. Jl. Hyg.*, vi, Suppmt., pp. 1–18. Baltimore, Md., July 1926.

Following an apparent absence for several years, yellow fever reappeared in Colombia in the latter part of 1922. As there seemed to be considerable danger of the disease spreading to some of the many villages along the Magdalena river, whence it could easily reach the coast, it was decided to start a preventive campaign in the principal port towns on the Caribbean coast. The work carried out at Barranquilla is described in detail ; it consisted of inspecting all the houses and surrounding water containers likely to afford suitable breeding-places for mosquitos. No attempt was made to differentiate between *Aëdes argenteus*, Poir. (*aegypti*, L.) and other domestic species. *Culex fatigans*, Wied. (*quinquefasciatus*, Say) was breeding in considerable numbers throughout the town, and other species of *Culex* were occasionally found. All breeding-places were promptly dealt with ; where possible containers were emptied, broken bottles along walls were filled with sand or some other suitable material, and in some cases a small species of fresh-water fish, *Dormitator maculatus*, obtained in numbers from the Magdalena river, was introduced into the water containers.

During the campaign between 30th October 1923 and 30th June 1924, 374,441 house visits were made and 962,544 water containers were examined, and the breeding in houses was reduced from over 50 to between 4 and 5 per cent., and the container index to between 1 and 2 per cent.

Carneiro (H.). **Medidas complementares anti-larvarias na prophylaxia da malaria.** [Complementary anti-larval Measures in the Prevention of Malaria.]—*A Folha Medica*, vii, no. 14, pp. 158–159. Rio de Janeiro, 16th July 1926.

This article describes briefly the various methods (oiling, applying Paris green, and stocking with larva-destroying fish) used against Anopheline larvae as auxiliaries to such permanent work as land reclamation and draining.

Martini (—). **Ueber Stechmücken und Malaria in der Unabhängigen Sozialistischen Räterepublik der Wolgadeutschen.** [On Mosquitos and Malaria in the Autonomous Socialist Soviet Republic of the Volga Germans.]—*Verh. Deutsch. Ges. angew. Ent., 5. Mitgliederversamml. Hamburg 16. bis 20. September 1925*, pp. 48–55. Berlin 1926.

In 1925 the author studied the mosquito fauna in the region of Saratov. As a result of famine the number of cattle has been very greatly reduced, and this region is the one where malaria was most rife during the epidemic of 1922–23. The character of the country, which includes the bed of the Volga with extensive areas that are subject to flooding, is described. Some specimens of *A. bifurcatus* were taken, but *A. maculipennis*, which is mainly responsible for the malaria, predominated. The author considers that as Anophelines readily bite cattle and other animals, where the number of cattle is suddenly diminished, they are driven to feed to an abnormal extent on man. Using the formulae suggested by Ross and taking the reduced number of cattle as 20 per cent. of the former stock the author concludes that the percentage of human beings infected with malaria has risen from about 8 per cent. to 98·5 per cent., a result that explains the epidemic.

[Palestine.] **Proceedings of the Twelfth Meeting of the Antimalaria Advisory Commission, Jerusalem, 27th May 1926.**—21 pp., multigraph.

Mr. R. Briercliffe gave details of the malaria incidence in Palestine from 1919 to 1925 and showed that there had been a very marked decrease during that period, which he ascribed mainly to the anti-mosquito measures that had been carried out, although other causes, such as low rainfall, had undoubtedly contributed to the result. Mr. W. K. Bigger gave an account of a brief malaria survey in Transjordan made in May 1926 ; on the whole malaria incidence was comparatively low, and he attributed this to the nature of the country and the low average rainfall, there being no swamps ; *Anopheles bifurcatus*, L., was found to be breeding in cisterns and *A. superpictus*, Grassi, in wadis and springs, but only one breeding-place suitable for *A. elutus*, Edw., was seen. Dr. J. M. Shapiro gave an account of the work of the Malaria Research Unit in the early part of the year ; during January and February destruction of hibernating adult mosquitos by " smoking " [*R.A.E.*, B., xii, 12] was carried out, and about the middle of March, after the heavy rains, breeding-places were inspected for the presence of hibernating larvae ; where larvae were found and the temperature of the water was above 15° C. [59° F.] larvicides were used on swampy places that could not be immediately eliminated by draining ;

immediately after the first application of larvicides the more extensive work of channelling and cleaning the pools and streams was begun. Mr. Briercliffe discussed the types of cistern covers in use in various parts of Palestine.

BENTLEY (C. A.). **Malaria and Agriculture in Bengal. How to reduce Malaria in Bengal by Irrigation.**—*Bengal, Public Health Dept.*, [vi+] 188+i–l pp., numerous charts. Calcutta, Bengal Secretariat Book Depot, 1925. Price, *Rs.* 2-2 ; 4*s.* **Idem** [abridged in :] *Jl. Trop. Med. & Hyg.*, xxviii–xxix, Colon Med. Repts. pp. 93–96, 1–13. London, 15th December 1925–15th February 1926.

The first five chapters of this book are mainly occupied by the discussion of extensive statistics that demonstrate the interdependence of decay of agriculture, decline of population, and increase of malaria in northern, central and western Bengal and the coincidence of flourishing agriculture, growth of population, and decrease of malaria in eastern Bengal. The main factors determining crop yield are fertility of the soil, adequate and seasonal rainfall and liability to enriching inundations with silt-bearing river water. Inundation during the monsoon is unfavourable to Anophelines because it obliterates the small collections of water that are most suitable for breeding ; large water areas produced by flooding have relatively little weedy edge, and their temperature is frequently raised by the sun to a point where it prevents or reduces mosquito breeding. Contrary to what is commonly assumed, deltaic land is usually naturally comparatively healthy, and the author contends that the extensive construction of embankments without adequate consideration of drainage and irrigation by river water has been largely responsible for the decay of agriculture and increase of malaria in Bengal.

The last four chapters contain discussions of the methods of preventing the spread of malaria in Bengal, and of reducing it in the delta region. To prevent the spread of malaria the author urges that the construction of embankments should be prohibited until methods have been devised that will not interfere with irrigation and drainage, and that the existing embankments and water-courses should be surveyed. On account of the magnitude of the problem malaria cannot be eradicated by anti-mosquito measures and quinine administration alone ; in the author's view, the remedy that must be adopted consists in the regulation of all surface waters, the improvement of the fertility of the soil, the cultivation of the crops best suited to local conditions, and the promotion of the increase and prosperity of the agricultural population ; its influence on malaria is both through its effect in reducing the numbers of Anophelines and through its effect on the population ; moreover the increased wealth of the community would enable larger sums of money to be spent on direct anti-mosquito measures. The method particularly applicable in the delta region of Bengal is irrigation, which is discussed in the concluding chapter.

STRICKLAND (C.). **A Critical Review of Dr. C. A. Bentley's "Malaria and Irrigation in Bengal."**—*Indian Med. Gaz.*, lx, no. 12, pp. 588–590, 2 pls., 2 refs. Calcutta, December 1925.

In criticising the above book the author takes exception to the use of examples from other parts of the world to show that the deltaic region

of Bengal would not naturally be malarious, on the ground that the species of *Anopheles* present in the various places cited as instances of non-malarious deltas have not been taken into account ; he considers that the construction of embankments has not played any important part in making the country malarious, and that the present distribution of the disease depends on local variations in the natural physiography of the delta. Further, the author is very doubtful whether irrigation will be effective in reducing malaria, and points out that the fast-flowing water of grass-edged irrigation channels provides breeding-places particularly suitable to *Anopheles aconitus*, Dön., one of the worst malaria carriers ; he is, however, in favour of irrigation, which he considers would undoubtedly be of economic value, even if it failed to reduce malaria.

Wellington (A. R.). **The Ways and Means adopted by Government for the Control of Malaria in the Federated Malay States.**—Fol., 6 pp. Kuala Lumpur, F.M.S. Govt. Press, 1926.

This paper, which was read at the Congress of the Far Eastern Association of Tropical Medicine at Tokyo in October 1925, describes the Government organisation for the study and control of malaria in the Federated Malay States and the nature of the work of the various departments concerned. Mainly as a result of the measures that have been adopted, the incidence of malaria has decreased very considerably in recent years.

Koun (—). **Evolution du paludisme dans la Ville et les environs de Hué.**—*Bull. Soc. Path. exot.*, xix, no. 5, pp. 335–337. Paris, 1926.

Commenting upon the malaria situation in French Indo-China, as described in a recent paper [*R.A.E.*, B, xiv, 46], the author draws attention to the almost total disappearance of malaria during the last 10 years from the town and environs of Hué. In 1912, the author prepared a report of the clinical records, malaria index and Anopheline incidence of the district ; at that time, malaria was raging, the predominating Anopheline of the region being *Anopheles* (*Myzomyia*) *subpictus* (*rossi*), other species that occurred being *A. aconitus* (*albirostris*), *A. minimus* (*christophersi*), *A. tessellatus*, *A.* (*Myzorhynchus*) *hyrcanus* var. *sinensis* and var. *pseudopictus*, *A.* (*Nyssorhynchus*) *punctulatus*, *A. stephensi*, *A. fuliginosus* and *A. philippinensis*.

[Rukhadze (N. P.).] Roukhadzé (N.). *Anopheles nigripes*, **Staeg. (1839) en Abasie (Géorgie).**—*Bull. Soc. Path. exot.*, xix, no. 5, pp. 337–339. Paris, 1926.

Anopheles plumbeus, Steph. (*nigripes*, Staeg.) was recorded for the first time from the Caucasus in 1924 (in Armenia) ; in 1925 its distribution seemed to extend throughout Abkhasia (Georgia). Though all previously recorded breeding-places are treeholes and similar stagnant collections of water, it was only once found in such a situation, but was frequently found in muddy and disturbed water, such as a canal reservoir. The length of life of the adults varied considerably in the laboratory, sometimes lasting only a few days. Males lived a much shorter time than females, the longest male life observed lasting 44 days. In Abkhasia, the larval development of *A. plumbeus* during the winter is very similar to that of *A. bifurcatus*, L., though probably slower.

With regard to the hibernation of the adults, no definite opinion is expressed, but it has been observed that at the beginning of the hibernation period *A. plumbeus* lays eggs, from which larvae hatch that develop very slowly during the winter, and at the approach of the first warm spring days transform into pupae and adults.

HOUDEMER (M. E.). **Note sur un Myriapode vésicant du Tonkin, *Otostigmus aculeatus*, Haase.**—*Bull. Soc. Path. exot.*, xix, no. 5, pp. 343–344. Paris, 1926.

The Myriapod, *Otostigmus aculeatus*, Haase, is a pest in houses in Tonkin during the hot weather. In the daytime it hides in dark spots and crevices in the walls and only comes out at night, when it easily creeps through the mesh of a mosquito net. At the least touch it emits a phosphorescent vesicant fluid that causes a painful lesion on the skin, lasting about a fortnight if left untreated.

In the comments on this paper it was stated that there are various species of phosphorescent Myriapods, which are of widespread distribution, but that the vesicant properties of their luminous secretion have not previously been recorded, and it would be interesting to know whether they produce the same reaction.

BAYLIS (H. A.), SHEATHER (A. L.) & ANDREWS (W. H.). **Further Experiments with the *Gongylonema* of Cattle.**—*Jl. Trop. Med. & Hyg.*, xxix, no. 13, pp. 194–196, 5 refs. London, 1st July 1926.

The experiments described were undertaken with a view to determining, if possible, the extent to which *Gongylonema "scutatum"* of cattle, which has been considered identical with *G. pulchrum* of pigs, can be transmitted to other hosts [*cf. R.A.E.*, B, xii, 128; xiii, 156]. The material used consisted of the cockroach, *Blattella germanica*, infected experimentally with larvae of the bovine *Gongylonema* in Italy and various dung beetles obtained from cow dung in northern Italy. Some of the latter were known to be infected. The experiments were made in England on English animals, which were extremely unlikely to have come in contact with *Gongylonema*, as *G. scutatum* appears to be very rare, or possibly entirely absent from this country.

Calves and sheep were easily infected by giving the animals a drench consisting of water containing the broken up infected insects. Pigs could not be infected, though this does not necessarily give any ground for considering that the pig Nematode is specifically distinct. It is possible that after a number of generations certain strains of the same species may become peculiarly adapted to certain hosts and may lose to a greater or less degree their power of adapting themselves to another one, but in the absence of recognisable morphological differences they cannot be considered as a distinct species.

CERRUTI (C.). **Le zecche degli animali domestici e la pratica del Dipping-tank.** [The Ticks infesting domestic Animals and the use of Dipping-tanks.]—*Clinica vet.*, xlix, no. 6, pp. 360–377, 1 plan, 11 refs. Milan, June 1926.

This review of the work done in various countries against ticks has been prepared with the object of assisting measures against them in Italy, and more especially in the Italian colonies.

Larisch (P.). **Die Gastrophiliasis des Pferdes.** [Oestrids infesting Horses.]—*Tierseuchenamt der Landw.-Kammer Schlesien*, 24 pp., 23 figs., 32 refs. Breslau, 1925. [Recd. August 1926.]

A survey is given of the biology of *Oestrus* (*Gastrophilus*) spp., their infestation of livestock, the pathological changes produced by them, and the measures directed against them. In Germany these flies are of some importance as pests of horses in certain regions, and during the war the losses due to their larvae became rapidly serious. *O.* (*G.*) *intestinalis* (*equi*), *O.* (*G.*) *pecorum* and *O.* (*G.*) *nasalis* are the species that are present in East Prussia. Carbon bisulphide is the best remedy at present known and should be administered in cigar-shaped capsules. It acts as a respiratory poison on the larvae. In districts where bot-flies are common, it is advisable to treat in October all horses that are exposed to attack.

Bishopp (F. C.), Laake (E. W.), Brundrett (H. M.) & Wells (R. W.). **The Cattle Grubs or Ox Warbles, their Biologies and Suggestions for Control.**—*U.S. Dept. Agric.*, Dept. Bull. 1369, 119 pp., 38 figs., 112 refs. Washington, D.C., April 1926.

This is a full account of the cattle grubs, *Hypoderma lineatum*, Vill., and *H. bovis*, DeG., with special reference to their occurrence in the United States, where they have been the object of study during several years. *H. bovis* is essentially a northern species ; in the United States *H. lineatum* is far the more widely distributed, has been known for many years and has been bred from the native bison, and may therefore be an indigenous species. The yearly loss to the hide, tanning and leather industries alone in the United States from these grubs is estimated at over £1,000,000, and the total yearly loss from all causes at about £10,000,000. In experiments with cattle controlled by muzzles and in cages, it was found that larvae, upon hatching from the eggs, penetrate through the skin at the points where the eggs are laid, and do not enter the mouth either in the egg or larval stage. The spot where the eggs are laid has no apparent effect either on the place where the larvae reach the subcutaneous tissues or on the time of their appearance. Larvae entering the skin of an animal on the leg may travel to the submucous layers of the gullet, as may also larvae removed from the gullet and introduced by incision under the skin on the leg. *H. lineatum* prefers the heels for oviposition, while *H. bovis* generally chooses the legs or thighs. The incubation period for *H. lineatum* is usually about 3–6 days, and for *H. bovis* about 3 days. After penetrating the skin, the larvae apparently work upward in the connective tissue and begin to appear in the chest and abdominal cavity about two months after penetration. Although many larvae enter the connective tissue of the gullet, many, especially in the case of *H. bovis*, may never enter that organ. The distance from the gullet and viscera to the subcutaneous tissues of the back is apparently traversed very rapidly, and the larvae, soon after reaching the back, cut a hole through the skin. The duration of the third stage of *H. lineatum* after the back is punctured lasts about 4 days, and of *H. bovis* about 3½ days. The total developmental period in the backs of cattle has been determined in many instances and districts, and seems to average somewhere about 50–55 days for *H. lineatum* and about 72 days for *H. bovis*. The time between emergence from the host and appearance of the adults

of *H. lineatum* in Texas averaged 41 days, and in the case of *H. bovis* in New York 31 days. Pairing of the adults takes place very soon after emergence, and oviposition may begin a few minutes later. The adults of both species live only a few days in captivity. The seasonal history of *H. lineatum* varies greatly with the latitude and other conditions, and in south-west Texas the life-cycle begins and develops considerably earlier than at higher altitudes and more northerly latitudes. The earliest appearance of *H. bovis* in the backs of cattle is somewhat later than that of *H. lineatum*. In the course of the present study, the dates in different regions when the earliest larvae mature and leave the host and when the last larva has reached the back have been determined, and these facts will be of great assistance in planning control measures.

Host resistance, acquired by age, is an influence that checks the abundance of these flies. No important insect enemies or diseases of either species have been found. The most effective time for the practice of remedies is during development of the larvae in the subcutaneous tissues of the back. Extraction of the larvae may then be accomplished as well as destruction of the grubs in the backs of the cattle with suitable insecticides, of which pyrethrum ointment, and benzol and carbon tetrachloride are recommended, as well as others already noticed [*R.A.E.*, B, xiii, 98, 140]. Experiments with insecticides and repellents applied by means of wading vats did not give good results. Infested cattle should be treated at intervals of not more than 35 days, the first treatment being given before the earliest larvae have matured and left the host. In most parts of the United States it is necessary to treat the cattle four times in a season to reach all the larvae.

CLEVELAND (C. R.). **Repellent Sprays for Flies attacking Dairy Cattle.**— *Jl. Econ. Ent.*, xix, no. 3, pp. 529–536. Geneva, N.Y., June 1926.

The protection of dairy cattle from blood-sucking flies, especially *Lyperosia* (*Haematobia*) *irritans*, L. (horn fly) and *Stomoxys calcitrans*, L. (stable fly), is an important problem that has received little attention. In most cases the only feasible means of affording protection is by spraying the cattle with repellent mixtures. This paper gives the results of experiments with various repellent sprays in Indiana in 1924 and 1925. A mixture of used crank case oil, 1 gal., and oil of tar, 1 pt., was the most satisfactory considered from all points of view; it was one of the most efficient and lasting repellents, easy to prepare, harmless to both men and animals, and very cheap, costing only about 7d. per U.S. gallon, which is sufficient for ten cows for two weeks, if sprayed once a day. The degree of protection given by the best repellents, although not complete, was high, and cows regularly sprayed were noticeably quieter and less nervous both at pasture and when milked. Repellent sprays are more effective in protecting cattle from *L. irritans* than from *S. calcitrans*, probably because the latter is more resistant to their effects and partly because it habitually attacks the legs and under parts, from which the spray is most likely to be washed off if the animals walk through long grass. One spray a day, applied immediately after the morning milking, was found generally to be sufficient, although a second, applied just before the evening milking, was sometimes thought desirable. Among herds that were carefully sprayed, a progressive reduction in fly infestation and nervous

response on the part of the animals was noticed as the season advanced. A compressed air sprayer is the most satisfactory type for spraying cattle.

Laake (E. W.), Parman (D. C.) & Bishopp (F. C.), U.S. Bur. Ent., & Roark (R. C.). **Field Tests with Repellents for the Screw Worm Fly,** *Cochliomyia macellaria*, **Fab., upon Domestic Animals.**—*Jl. Econ. Ent.*, xix, no. 3, pp. 536–539. Geneva, N.Y., June 1926.

The experiments here described were in continuation of previous ones [*R.A.E.*, B, xi, 121 ; xiv, 26] and were carried out in Texas. Eighteen mixtures that had been found to be effective repellents for *Cochliomyia macellaria*, F. (screw-worm fly) were tested, and the results obtained with eleven of these are given. Chloroacetone, although a good repellent, caused severe irritation, owing to the formation of hydrochloric acid in the wound. The eleven mixtures were tested on goats, and some of them on sheep and cattle ; before applying the repellent to a wound the larvae of *C. macellaria* in it were killed by the application of benzene [*R.A.E.*, B, xiv, 43] and removed. The relative efficacy of the repellents was judged by the average number of re-infestations per wound treated that took place. As injury by *C. macellaria* is often so severe as to result in death, no untreated animals were used as controls. The best of the materials tested, taking into consideration effectiveness, cost, availability, and its excellent adhesiveness, was pine tar oil, sp. gr. 1·065.

Webb (J. L.). **Origin and Life-cycle of Grubs in Cattle Hides.**—*Jl. Amer. Leath. Chem. Assoc.*, xx, no. 10, pp. 453–456, 2 pls. New York, 1925. (Abstract in *Expt. Sta. Record*, liv, no. 3, p. 260. Washington, D.C., February 1926.)

A summary of the replies to a questionnaire sent to cattlemen, packers, butchers and tanners shows that 19 per cent. of all the hides in U.S.A. are infested with *Hypoderma* and that this may rise during the warble fly season to as much as 50 per cent. The annual reduction in the value of the hides and leather is estimated at from between one and two million pounds.

Cameron (A. E.). **Bionomics of the Tabanidae (Diptera) of the Canadian Prairie.**—*Bull. Ent. Res.*, xvii, pt. 1, pp. 1–42, 5 pls., 18 figs., 32 refs. London, July 1926.

A general account is given of the habitats and bionomics of the Tabanids of the Canadian Prairie, and their connection with infectious anaemia or swamp fever of horses is discussed. Notes and descriptions of the early stages of the following species are included : *Chrysops discalis*, Will., *C. excitans*, Wlk., *C. frigidus*, O.S., *C. fulvaster*, O.S., *C. mitis*, O.S., *C. moerens*, Wlk., *C. proclivis*, O.S., *Haematopota americana*, O.S., *Tabanus duplex*, Wlk., *T. hirtulus*, Big., *T. illotus*, O.S., *T. insuetus*, O.S., *T. lasiophthalmus*, Macq., *T. nivosus*, O.S., *T. phaenops*, O.S., *T. reinwardti*, Wied., *T. rhombicus*, O.S., and *T. septentrionalis*, Lw.

A Proctotrupid, *Trichopria tabanivora*, sp. n., parasitic on pupae of *T. reinwardti* and *C. mitis* in Saskatchewan is described, other parasites

being *Phanurus emersoni*, Gir., and *Trichogramma minutum*, Riley, infesting Tabanid eggs and *Diglochis occidentalis*, Ashm., infesting pupae.

Shannon (R. C.). U.S. Bur. Ent. **Synopsis of the American Calliphoridae (Diptera).**—*Proc. Ent. Soc. Wash.*, xxviii, no. 6, pp. 115–121. Washington, D.C., June 1926.

In this paper an attempt is made to deal with all the species of American Calliphorids. Keys are given to the subfamilies, tribes and genera and to the species of some of the genera. A number of new genera and species are described.

Hardy (G. H.). **Notes on Australian Flies of the genus** *Calliphora*.—*Proc. R. Soc. Queensland*, xxxvii, no. 10, pp. 168–173. Brisbane, 1926.

Since the publication of a former (preliminary) synonymic list of Australian Calliphorines [*R.A.E.*, B, xi, 43], information has been obtained that necessitates the revision of certain names, and a key is now given to the Australian species of *Calliphora*, the synonymy being amended chiefly from Patton's classification [*R.A.E.*, B, xiii, 165], with notes on the species.

Kröber (O.). **Neue Dipteren aus Aegypten.**—*Bull. Soc. R. ent. Egypte*, xviii (1925), no. 4, pp. 232–243, 1 fig. Cairo, 1926.

Among these notes on Egyptian Diptera is a description of the Tabanid, *Ochrops aegyptiacus*, sp. n.

Chandler (A. C.). **Animal Parasites and Human Disease.**—8vo., 3rd edn., revd., xiii+573 pp., 254 figs. New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Ltd., 1926. Price 22*s*. 6*d*. net.

In this edition of this work the plan of the previous ones [*R.A.E.*, B, vi, 113; xi, 86] has been followed very closely, changes being made in the text to bring it into line with recent advances in parasitology and preventive medicine.

Transmission of Dengue Fever.—*Jl. R.A.M.C.*, xlvi, no. 6, pp. 445–448. London, June 1926.

This is an editorial review of the work of Siler, Hall, and Hitchens [*R.A.E.*, B, xiv, 124] on the transmission of dengue in the Phillippines by *Aëdes argenteus*, Poir. Previous investigations on the transmission of the disease [*R.A.E.*, B, iv, 196; vi, 195] are also briefly discussed. The author considers that more extensive negative transmission experiments with *Culex fatigans*, Wied., would be desirable before definitely concluding that it is unable to transmit the disease, also, especially in view of the work of Koizumi, Yamaguchi & Tonomura [*R.A.E.*, B, vi, 195] in Formosa, where *A. argenteus* is only of local and irregular occurrence, that other species of *Aëdes* will probably prove to be efficient transmitters of dengue.

KEANE (P. M.). **A Light-trap for Flies.**—*Jl. R.A.M.C.*, xlvi, no. 6, pp. 450–452, 3 figs. London, June 1926.

The principle on which the light trap here described is based, is the attraction of light for flies confined in the dark. The trap consists of a wooden box of any convenient size with an aperture 4 by 1 ins. in one side ; in the aperture are placed two small pieces of glass (such as microscope slides) with their faces parallel and $\frac{1}{4}$ in. apart, overlapping by about one inch in the middle of the aperture. Part of the roof of the box consists of glass through which light shines on to the small aperture in the side, and a door is made at the back for cleaning the trap or for placing in it an insecticide such as pyrethrum powder. The trap is fixed to an aperture in the window or wall of a room, so that the light from without shines on to the small glass opening, and the room is then made completely dark ; all flies in the room are quickly attracted to the one point of light and pass between the overlapping pieces of glass into the trap, from which they do not return. The trap can also be illuminated by artificial light.

If it is not of importance that the flies should be trapped, two overlapping pieces of glass may be inserted in a loophole in the wall of the room, so that they escape into the outer air when it is darkened.

ADLER (S.) & THEODOR (O.). **Further Observations on the Transmission of Cutaneous Leishmaniasis to Man from** *Phlebotomus papatasii*.—*Ann. Trop. Med. & Parasit.*, xx, no. 2, pp. 175–194, 3 pls., 8 refs. Liverpool, 24th June 1926.

From October to December 1924, and from April to December 1925, sandflies were systematically collected in Jericho with the object of determining their infection rate with herpetomonads in an endemic centre of cutaneous leishmaniasis (oriental sore).

The following is taken from the authors' summary of the results. The infection rate of sandflies with herpetomonads in Jericho was found to be about 1 per 1,000 during 1925. The morphology of naturally occurring herpetomonads in *Phlebotomus papatasii* is described. Two out of three experiments in transmission of cutaneous leishmaniasis from sandflies naturally infected with herpetomonads were successful. Sandflies were artificially infected with *Leishmania* (*Herpetomonas*) *tropica* by feeding on oriental sores, 10 per cent. becoming infected. Attempts to transmit oriental sore to seven volunteers by 11 inoculations with material from sandflies artificially infected with *L. tropica* were all negative with an observation period of $3\frac{1}{2}$ to 4 months, except in one case details of which are given in an addendum.

BLACKLOCK (D. B.). **The Further Development of** *Onchocerca volvulus* **Leuckart in** *Simulium damnosum* **Theob.**—*Ann. Trop. Med. & Parasit.*, xx, no. 2, pp. 203–218, 1 pl., 1 fig. Liverpool, 24th June 1926.

The following is the author's summary of this paper, which supplements a previous one [*R.A.E.*, B, xiv, 62] : Larvae of *Onchocerca volvulus*, taken up from the skin by *Simulium damnosum* in biting,

undergo progressive development in the fly and finally reach the proboscis; the time taken to complete the development depends largely upon temperature. The shortest period that elapsed after feeding before the proboscis became infected was 7 days. The mature larvae are found in the labium of the fly and escape through the membranous portion of it. In so far as experiments with wild flies can be accepted as evidence in the absence of actual transmission to man or animal, *S. damnosum* is a vector of *O. volvulus*.

Nicolle (C.) & Anderson (C.). **Fièvre récurrente transmise à la fois par ornithodores et par poux.**—*C.R. Acad. Sci. France*, clxxxii, no. 24, pp. 1450–1451. Paris, 1926.

Contrary to the authors' expectations that *Ornithodorus savignyi*, Aud., which is common in North Africa and closely allied to *O. moubata*, Murr., the vector of tick fever in Central Africa, was concerned, as well as lice [*Pediculus*], in the transmission of relapsing fever in Tunisia, this tick has been found incapable of carrying the disease.

They have, however, been successful in transmitting by means of lice the recently described form of relapsing fever recorded in Spain, the natural vector of which is a species of *Ornithodorus* [*R.A.E.*, B, xiv, 89]. This form of relapsing fever, with its two vectors, while having a place between that of Central Africa, which can be transmitted only by species of *Ornithodorus*, and the common European form, carried by lice, appears more nearly allied to the former. That of North Africa also more closely resembles the Spanish form than it does the ordinary European type.

In the authors' view the spirochaetes of relapsing fever, transmitted originally by species of *Ornithodorus*, accidentally infected lice. The infection being thus more easily carried, an endemic disease of Central Africa was converted into an epidemic, world-wide one.

Wollman (E.). **Observations sur une lignée aseptique de Blattes (*Blattella germanica*) datant de cinq ans.**—*C.R. Soc. Biol.*, xcv, no. 22, pp. 164–165. Paris, 25th June 1926.

Several species of flies, as well as the wax moth, *Galleria mellonella*, have been reared aseptically by various investigators, and the author has been rearing aseptically the cockroach, *Blattella germanica*, since 1921. The technique is described. The experiments have again proved the fact that insects can live and reproduce normally in the absence of micro-organisms. In 1919, the author showed that insects do not show the requirement of vitamins that vertebrates have, and cockroaches can undoubtedly do without them. In the present experiments, *B. germanica* was fed from hatching on foods absolutely deprived of vitamins, and developed in every way as well as others receiving vitamins A and B. Bacteriological sterility excluded the possibility of synthesis of vitamins on the spot. The absence of micro-organisms has no influence on the production of bacteroids, which were found with the same characteristics and in the same abundance in aseptic cockroaches of the 13th generation as in normal ones. Attempts to obtain cultures of these bacteroids failed, but these aseptic insects should be excellent material for the study of these and of the digestive ferments of insects.

CHORINE (V.). **Microbes provoquant une maladie mortelle chez les chenilles de** *Galleria mellonella*.—*C.R. Soc. Biol.*, xcv, no. 22, pp. 199–201. Paris, 25th June 1926.

From diseased individuals of *Galleria mellonella*, the author has obtained cultures of two organisms. The first is evidently the same as that obtained by Metalnikov in 1922 [*R.A.E.*, A, x, 519], and the author proposes to name it *Bacterium galleriae*. This organism is very virulent to the larvae of *G. mellonella*, and is also very pathogenic to guineapigs and mice. The other organism is a *Streptococcus*, *S. galleriae*, sp. n., which is somewhat pathogenic to the larvae, but is harmless to guineapigs and mice.

COUSIN (G.). **Influence du temps réservé à la nutrition sur les phases du cycle évolutif et les métamorphoses de** *Calliphora erythrocephala*.—*C.R. Soc. Biol.*, xcv, no. 26, pp. 565–568, 2 refs. Paris, 23rd July 1926.

Experiments with *Calliphora erythrocephala*, Mg., are described in which the larvae were fed for limited periods below that usually required in nature. Under these conditions, the resulting adults were dwarfed, but even after limiting the feeding period through several generations, normal adults were obtained as soon as the larvae were allowed to feed for the usual length of time.

PINTO (C.) & DE BARROS BARRETO (J.). **Uma nova especie de "Barbeiro" do Bresil** (*Triatoma petrochii*, **n. sp.**).—*Sciencia medica*, iii, no. 12, p. 769. Rio de Janeiro, 31st December 1925.

Triatoma petrochii, sp. n., is described from Rio Grande (Brazil), the characters that distinguish it from *T. brasiliensis* being discussed.

PINTO (C.). *Eutriatoma tibiamaculata*, **novo genero e nova especie; forma intermediaria entre** *Rhodnius* **et** *Triatoma*.—*Sciencia medica*, iv, no. 3, pp. 133–136, 5 figs. Rio de Janeiro, 31st March 1926.

Eutriatoma tibiamaculata, gen. et sp. n., is described from a house in the State of Rio, its characters showing it to be intermediate between *Rhodnius* and *Triatoma*.

PINTO (C.). **Sobre a presença do** *Triatoma geniculata* **na ilha de Trinidad.**—*Sciencia medica*, iii, no. 12, p. 774; iv, no. 2, p. 90. Rio de Janeiro, 31st December 1925 and 28th February 1926.

The occurrence in Trinidad of the Reduviid, *Triatoma geniculata*, Latr., is recorded.

DE BERGEVIN (E.). **Note à propos d'un nouvel Hémiptère Capsidae se révélant suceur de sang humain.**—*Bull. Soc. Hist. nat. Afr. N.*, xvii, no. 6, pp. 173–174. Algiers, 15th June 1926.

A case is recorded from Algeria of the Capsid, *Maurodactylus albidus* var. *discoidalis*, Reut., which is generally found on crucifers, biting man. Other Rhynchota recorded as occasional blood-suckers are the Lygaeids, *Leptodemus minutus*, Jak., *Geocoris henoni*, Put., and *G. scutellaris*, Put., and the Capsid, *Brachynotocoris puncticornis*, Reut.

(K3081) Wt P5/35 1,500 10/26 H & Sp Gp 52

Wada (Hiratake). **Klinische und experimentelle Untersuchung über die durch die Giftraupe** *Dendrolimus spectabilis* **verursachte Dermatitis und ihre Ursache.** [A clinical and experimental Investigation on the Dermatitis due to the poisonous Caterpillar of *D. spectabilis* and on its Cause.]—*Jap. Jl. Dermatol. & Urol.*, xxv, no. 8. Tokyo, 1925. (With a Summary in German, pp. 91–92.) (Abstract in *Arch. Schiffs.- u. Trop.-Hyg.*, xxx, no. 8, p. 351. Leipzig, 1st August 1926.)

In Japan the hairs of the caterpillar of *Dendrolimus spectabilis* cause dermatitis in man, which lasts 1 or 2 weeks. The irritation is due to the barbed hairs and to a substance in them that can be extracted with water or glycerine and which, when injected subcutaneously, gives rise to the same symptoms.

Essed (W. F. R.). **De** *Sarcopsylla penetrans* **en hare betrekkingen met de Elephantiasis arabum in de Kolonie Suriname.** [*Tunga penetrans* and its Relation to Elephantiasis arabum in the Colony of Surinam.]—*Geneesk. Tijdschr. Ned.-Indie*, lxvi, no. 3, pp. 424–440, 11 figs. Batavia, 1926.

The chigger flea, *Tunga* (*Sarcopsylla*) *penetrans*, is very common in Dutch Guiana. Elephantiasis of the foot occurs, though the negroes in the interior are not infected with filaria. This is attributed to the absence of *Culex fatigans* in the interior of Surinam. Elephantiasis of the foot, however, hardly ever occurs unless a bacterial infection is present as well as filaria ; and there is no elephantiasis without a preceding lymphangitis. This indicates a relation between *T. penetrans* and elephantiasis. The author thinks that the bacterial infection occurs as a result of the careless removal of the flea without disinfection of the wound.

França (C.). **Quelques considérations sur les** *" Leishmania "*.—*Mem. e Estudos Mus. zool. Univ. Coimbra*, Ser. ii, no. 2, pp. 1–13, 4 figs., 11 refs. Coimbra, 1926.

Attention is called to the confusion in the classification of the flagellates for which Ross created the genus *Leishmania* and for which some authors have used the genera *Herpetomonas* or *Leptomonas*. These have been regarded as synonyms, but they are distinct, and the characters distinguishing them are re-described here. At the present time *" Leishmania "* spp. are accepted as being insect flagellates adapted to live in vertebrates, but it is not known whether they belong to *Herpetomonas* or *Leptomonas*.

Catanéi (A.) & Parrot (L.). **Sur le virus de la spirochétose aviaire en Algérie et sur la longue durée de sa conservation chez** *Argas persicus*.—*Bull. Soc. Path. exot.*, xix, no. 6, pp. 419–421, 4 refs. Paris, 1926.

A comparison of the causal organism of spirochaetosis in fowls in northern Algeria with *Spirochaeta gallinarum* from Brazil proved them to be identical ; the same species is also responsible for infection of ducks in Algeria. Laboratory experiments show that the virulence of *S. gallinarum* may last for over two years in *Argas persicus*.

Borel (M.). **Note préliminaire sur les moustiques de Cochinchine et du Sud Annam (Massif du Langbian).**—*Bull. Soc. Path. exot.*, xix, no. 6, pp. 472–479, 2 refs. Paris, 1926.

As a result of observations made in Cochin China and south Annam in 1925, 45 mosquitos, including *Aëdes argenteus*, Poir., and 10 Anophelines, are recorded, with notes on the habitats of the adults and larvae. *Anopheles* (*Pseudomyzomyia*) *vagus*, Dön., occurred in small sunny pools with or without vegetation ; *A.* (*Neomyzomyia*) *kochi*, Dön., was found in similar places without vegetation. The streams and overgrown pools near human habitations also contained *A. barbirostris*, Wulp, *A. hyrcanus*, Pall., and *A.* (*N.*) *tessellatus*, Theo. *A.* (*N.*) *leucosphyrus*, Dön., occurred in wooded areas, and *A.* (*Neocellia*) *fuliginosus*, Giles, was found in tree-holes or cut bamboos containing rainwater. The last named and *A.* (*N.*) *jamesi*, Theo., *A.* (*N.*) *maculatus*, Theo., and *A. aitkeni*, James, occurred at altitudes between 1,000 and 2,000 feet.

[Rukhadze (N. P.).] Roukhadzé (N.). **L'hibernation des Anophèles et des *Stegomyia* en Abasie (Géorgie maritime).**—*Bull. Soc. Path. exot.*, xix, no. 6, pp. 480–487, 7 refs. Paris, 1926.

During the winter of 1925–26 observations made on various mosquitos showed that in Abkhasia (Georgia) *Anopheles maculipennis*, Mg., passes the winter in the adult stage, being ready for oviposition as soon as conditions are suitable in the spring, while *A. bifurcatus*, L., and *A. plumbeus*, Hal. (*nigripes*, Staeg.) lay their eggs in the autumn. These hatch gradually, the pupae appearing in the spring and giving rise to the adults of the first generation. *Aëdes argenteus*, Poir. (*Stegomyia fasciata*, F.) and *A. albopictus*, Skuse (*S. scutellaris*, Theo.) also oviposit in the autumn, the winter being passed in the egg stage.

During laboratory observations it was noticed that *Theobaldia annulata*, Schr., showed a distinct preference for certain individuals, feeding more readily on those with fat arms. This probably accounts for the contradictory statements made regarding the blood-sucking habits of this species.

Ewing (H. E.). U.S. Bur. Ent. **A Revision of the American Lice of the Genus *Pediculus*, together with a Consideration of their Geographical and Host Distribution.**—*Proc. U.S. Nat. Mus.*, lxviii, art. 19, no. 2620, 30 pp., 3 pls., 8 figs., 25 refs. Washington, D.C., 1926.

This revision of the genus *Pediculus* is confined to forms occurring in America. *Parapediculus*, subgen. n., with type *P. consobrinus*, Piag., is erected for the species of *Pediculus* living on spider-monkeys (*Ateles*) ; structurally this subgenus differs from the subgenus *Pediculus* particularly in the shape of the typical pleural plates.

Pediculus capitis, DeG., is considered to be a synonym of *P. humanus* var. *humanus*, L. ; the other human lice here dealt with are *P. humanus* var. *corporis*, DeG., this variety and the preceding being assumed to have originated from the Caucasian race of man, *P. humanus* var. *nigritarum*, F., assumed to have originated from African negroes, *P. humanus* var. *angustus*, Fahr. (varr. *marginatus*, Fahr., *chinensis*, Fahr.)

originating from the Mongolian race of man, and *P. humanus*, var. *americanus*, n., described from specimens from mummies of American Indians.

The lice from monkeys dealt with are *P. lobatus*, Fahr., from *Ateles pan*, *P. atelophilus*, sp. n., from *A. geoffroyi*, *P. consobrinus*, from *A. paniscus*, and *P. chapini*, sp. n., from *A. ater*.

The lice found infesting man in America at the present day are mainly hybrid races of head lice, the pure strains of which were originally found on the white, black, red, and yellow races of man. No evidence was found to indicate that each of the primary races of man harboured a different variety of clothes louse as well as a different variety of head louse, and it is considered that the clothes louse developed as a different type only on certain races.

The author suggests two possible explanations of the occurrence of *Pediculus* on *Ateles*, which is a genus not held to have any immediate phylogenetic relationship with man, but in which the hair and blood more closely resemble man's than do those of most monkeys. Either the lice originated on man and spread to the monkeys when man reached tropical America, but before the differentiation of *Ateles*, which apparently followed dispersion, occurred, since so far as is known, each species of *Ateles* harbours a different species of *Pediculus*. Or *Pediculus* is a generalised type that is in an unusual degree free from the influences of its environment, in which case it is to be expected that it will eventually be recorded from several diverse groups of Primates ; Fahrenholz has reported *Pediculus* from gibbons (*Hylobates*) in the Old World.

Puri (I. M.). **On the early Stages of some of the Scandinavian Species of *Simulium* (Simuliidae, Diptera, Nematocera).**—*Parasitology*, xviii, no. 2, pp. 160–167, 9 figs., 3 refs. Cambridge, July 1926.

The species dealt with are *Simulium pusillum*, Fries, *S. pallipes*, Fries, *S. lyra*, Lundström, *S. ferruginum*, Wahlgren, and three unnamed species.

Duncan (J. T.). **On a Bactericidal Principle present in the Alimentary Canal of Insects and Arachnids.**—*Parasitology*, xviii, no. 2, pp. 238–252, 7 refs. Cambridge, July 1926.

As some of the commoner pathogenic bacteria when taken up by an Arthropod do not survive in it for long, these investigations were undertaken with the object of determining the nature of the bactericidal action and its occurrence or non-occurrence in various insects and ticks.

The species selected for the experiments were *Stomoxys calcitrans*, *Musca domestica*, *Anopheles bifurcatus*, *Aëdes cinereus*, *Cimex lectularius*, *Rhodnius prolixus*, *Argas persicus* and *Ornithodorus moubata*.

The gut-contents of some Arthropods appear to be remarkably sterile, and in this connection Dr. Breinl of Prague states that in his researches on typhus fever thousands of lice [*Pediculus*] were dissected to ascertain if they carried *Bacillus proteus*, but bacteria were invariably absent. Only the adult stages of the above-mentioned Arthropods were used ; in all the bactericidal principle was demonstrated in the gut-contents, and in the case of the insects, also in the faeces.

From the results of the bactericidal and absorption tests, it may be inferred that the active principle in any one species of Arthropod is

single, but that different groups of bacteria exhibit differences in susceptibility to its action. Some are destroyed by weak concentrations, whereas staphylococci require fairly high concentrations, and some bacteria appear to be wholly resistant. The bactericidal action is greater at 37° C. [98·6° F.] than at room temperature; it is not accompanied by any visible bacteriolysis. The bactericidal principle retains its activity unimpaired for at least 6 months when kept in the dry state, will resist temperatures as high as 120° C. [248° F.], is not destroyed by tryptic digestion, is precipitated from solution with proteins by alcohol or acetone, but is not itself affected by these reagents, and is not soluble in the common fat solvents.

No vital process is involved in the bactericidal action, which closely resembles that of an antiseptic. The active principle is formed in the stomach, but whether as the result of a secretion of the gastric cells or of the process of digestion is not clear.

BEATTY (M. C.). **Disinfestation of Barracks.**—*Jl. R.A.M.C.*, xlvii, no. 1, pp. 59–61. London, July 1926.

Zyklon " B " is a siliceous earth impregnated with hydrocyanic acid gas, to which a tear gas is added. It has been successfully used in orange groves in Spain and Egypt for the destruction of agricultural pests. Its use for fumigating barracks during the British occupation of the Rhine is here described. After the building has been sealed by papering the doors and windows and any other openings, the required amount of Zyklon " B " is emptied on the floor of each room, beginning at the top of the house. If the temperature is below 50° F., it should be heated to stimulate the respiration of insects present. At this temperature or above it, the gas will have been sufficiently effective after the lapse of 6 hours with a concentration of 1 per cent. The house is then ventilated until tests show it to be free from the gas. Even during ventilation, the temperature should be maintained, otherwise the gas would remain too long on walls and articles in the rooms. About 5–7 days are required from the beginning to the end of the work connected with the fumigation of large barracks; during dry and windy weather the time is shortened. The work should be done by an experienced staff.

Cimex lectularius, L., in all stages from the developing egg to the adult, was placed in some of the rooms, and all were destroyed by the gas. Though the buildings before treatment contained also lice [*Pediculus*], fleas and cockroaches, they were still free from all these pests two months after fumigation. The gas penetrates through the smallest cracks, a further advantage being its chemical inactivity, as a result of which, furniture and foodstuffs are unaffected.

SUTTON (E. A.). **A Case of Myiasis of the Temporal Bone.**—*Jl. R.A.M.C.*, xlvii, no. 1, pp. 61–63, 1 fig. London, July 1926.

In the case described, 137 larvae of *Chrysomyia bezziana*, Vill., were removed from a lesion behind the ear of a European, in south India. The eggs must have been deposited on a small discharging sinus left by an abscess. The importance of covering even trivial wounds and abrasions in places where flies of this type occur, is pointed out.

CONNAL (A.). **Annual Report of the Medical Research Institute.**—*Nigeria: Ann. Med. & Sanit. Rept. 1924,* Appx. i, 45 pp. Lagos, 1926.

During the latter half of 1924, an epidemic of plague occurred for the first time on record at Lagos. A general account is given of the epidemic and the resulting rat surveys. The parasites collected from the rats were *Laelaps echidninus,* Berl., and the fleas, *Xenopsylla cheopis,* Roths., *X. brasiliensis,* Baker, and *Ctenocephalus canis,* Curtis. The first two fleas were most abundant during October and November, which were two of the worst months of human plague. All three species also occurred in uninfected districts.

Of the mosquitos collected between December and February, *Taeniorhynchus* (*Mansonioides*) *africanus,* Theo., was much the most numerous, others being, *Culex* (*Culiciomyia*) *nebulosus,* Theo., *C. thalassius,* Theo., *C. rima,* Theo., *Anopheles gambiae,* Giles (*costalis,* Theo.) and *A. squamosus,* Theo.

Numbers of spirochaetes were found in the stomach of *T. africanus,* and sporozoite-like structures in the salivary gland of one individual. A small Nematode was found in *C. rima.* Blood-sucking Diptera sent from various districts and examined for filaria, with negative results, included *Chrysops silacea,* Aust., *C. longicornis,* Macq., *Glossina palpalis,* R.-D., *G. caliginea,* Aust., *G. pallicera,* Big., *Haematopota bullatifrons,* Aust., *Tabanus taeniola,* P. de B., *Simulium damnosum,* Theo., and *Anopheles gambiae.*

A list is given of the Diptera sent in from various districts for identification.

WELLHOUSE (W. H.). **How Insects Live. An Elementary Entomology.**—8vo, xv+435 pp., 333 figs., numerous refs. New York, The Macmillan Co., 1926. Price $5.

The object of this book is to provide a basis for a course of general entomology to precede courses in economic entomology in schools. The first two chapters are introductory and contain a brief general survey of the science of entomology and an account of insect physiology and anatomy. The main part of the book consists of descriptions of the life-histories of individual species of insects, mostly those occurring commonly in North America, to illustrate the characteristics of the various orders; in many cases these accounts are very full, and important details of morphology are brought into them. The author has adopted this plan believing that a student learns more from detailed accounts of a few species than from generalised accounts of families. A chapter is devoted to the treatment of each order, and contains a few introductory paragraphs, followed, except in the case of the smallest and least important orders, by accounts of one or more species; a few selected references to papers on the subjects dealt with are given after each.

Subsequent chapters include: A list of the families of the class Insecta, arranged systematically, the name of each being followed by a few words describing its habits or appearance; an account of the phylum Arthropoda, the classes of which are briefly discussed; suggestions for collecting insects; and keys to the principal orders and families of adult insects, and to the orders of some larvae.

Fletcher (W.) & Lesslar (J. E.). **Tropical Typhus in the Federated Malay States. With a Compilation on Epidemic Typhus.**—*Bull. Inst. Med. Res. F.M.S.*, 1925, no. 2, 88 pp., 3 pp. refs. London, 1925. [Abridged in] *Malayan Med. Jl.*, i [no. 2], pp. 17–22. Singapore, May 1926.

Details are given of the disease known as tropical typhus in the Malay States. Though the transmitting agent is not known, it is considered that lice are not incriminated. The occurrence of the disease in limited areas of uncultivated land suggests that its aetiology may be similar to that of tsutsugamushi or of Rocky Mountain spotted fever; none of the lesions associated with the former were found in any of the cases discussed. In order that the disease may be compared with the louse-borne typhus of other countries the information concerning the latter is reviewed at length in the more extensive paper.

Gammans (L. D.). **Anti-Malaria Work at Port Dickson.**—*Malayan Med. Jl.*, i [no. 2], pp. 24–28. Singapore, May 1926.

The organisation of draining and oiling for the control of mosquitos in the neighbourhood of Port Dickson, F.M.S., is described. The chief malaria carrier is *Anopheles maculatus*, Theo., and its favoured breeding-places, such as fresh clear water seepages, are extremely numerous. Should *A. ludlowi*, Theo., be introduced along the coast area, the malaria problem would at once become more difficult; in many parts of the coast conditions are very favourable to this species. The policy has been to eliminate so far as possible all Anophelines, especially *A. maculatus*. *A. umbrosus*, Theo., was only found in one place in a swamp, and the area was completely dried by a fairly deep drain; *A. separatus*, Leic., was extremely numerous in 1923; *A. hyrcanus*, Pall., var. *sinensis*, Wied., *A. barbirostris*, Wulp, and *A. kochi*, Dön., were breeding in large numbers in a swamp where draining and oiling is impossible; *A. karwari*, James, and *A. subpictus*, Grassi (*rossi*, Giles) have also been found.

An uncemented pool, which could not be oiled, was treated by introducing a larvicidal fish (*Haplochilus panchax*).

Though no accurate figures of the rate of malaria infection before and after the measures were started are available, it has been proved that the disease can be economically stamped out of an extended area like the one under review.

Fermi (C.). **Note di anofelinologia.**—*Riv. Malariologia*, v (N.S. i), no. 3, pp. 286–302. Rome, May–June 1926. (With Summaries in French and English.)

Waters under shade or in wells, cisterns, etc., contain neither floating algae nor Anopheline larvae. As oviposition occurs after sunset, it is probable that the lack of algae is the reason why the mosquitos do not lay their eggs in such waters. The scarcity of Anopheline larvae in natural ponds or pools with an abundant fauna of Arthropods, fish, reptiles, etc., is due not only to the destruction done by these enemies, but also to the floating poisonous excretory matter.

Up to the present artificial pools as trap breeding-places, and such traps for the adults as badly-lit hiding places, sticky surfaces, light-traps and screen traps fitted to the entrances of dwellings, stables or

pigsties, have none of them proved really successful. As it is difficult to capture mosquitos in animal quarters with dark walls, such walls may be hung with white fabric.

Creosote is an efficient larvicide at the rate of 1 part in 4 million parts of water; at the rate of 1 part in 7–8 millions it is ineffective. When applied to the walls and ceilings of houses [*cf. R.A.E.*, B, xi, 97] creosote had no repellent effect on adult Anophelines.

VALLE (V.) & SEPULCRI (P.). **Sull'attività larvifaga d'un pesciolino nostrano (scardola). Nota preventiva.** [On the larviphagous Activity of an Italian Fish. Preliminary Note.]—*Riv. Malariologia*, v (N.S. i), no. 3, pp. 306–309. Rome, May–June 1926.

In Venetia the top minnow, *Gambusia*, which has been imported against mosquito larvae, cannot withstand the usual winter temperatures, and unless great expense is incurred in keeping up heated breeding tanks in winter it is necessary to renew the supply in spring. A native species, probably *Leuciscus erythrophthalmus*, is said to have given excellent results during the past two years.

[CHENTZOV (B.).] **Ченцов (Б.). The Structure of the Egg-shell of *Culex pipiens*, L., and *Anopheles maculipennis*, Meig.** [*In Russian.*]—*Bull. Polytech. Inst. Tiflis*, i, pp. 22–32, 1 pl., 15 refs. Tiflis, 1924. (With a Summary in German.) [Recd. July 1926.]

The contents of this paper are indicated by the title.

JAMES (S. P.) & SHUTE (P. G.). **Report on the first Results of Laboratory Work on Malaria in England.**—*Publ. League of Nations*, iii, Health. (Review in *Brit. Med. Jl.*, no. 3418, p. 79. London, 10th July 1926.)

Working with *Anopheles maculipennis*, Mg., as the vector of malaria in the treatment of general paralysis, it was found that the mortality of this mosquito kept in artificial "tropical" conditions at 24° C. [75·2° F.] was about 50 per cent. during each 7–10 days of life. At 22° C. [71·6° F.] it was less, but the time taken for the mosquitos to become infected was longer, and fresh feeds of blood were needed daily, or every other day. If a temperature of 26° C. [78·8° F.] was maintained with a view to obtaining quick infection, nearly all the mosquitos died before the salivary glands contained sporozoites. At a low temperature, such as 4–6° C. [39·2–42·8° F.], infected mosquitos lived up to two and a half months and retained their infectivity. These facts may help to explain the absence of new cases during very hot seasons, and also, since the oöcysts are arrested in development, but not killed by the low temperatures, the recrudescence of cases in the spring.

The authors found that a surprisingly small number of persons who suffer from malaria are infective to *Anopheles*. Some with induced malaria were not infective at any period, and the strikingly infective patient was a rarity, while repeated feeds on an infected patient were needed to infect the mosquito. Since this occurred under the most favourable artificial conditions, it is thought probable that 95 per cent. of potential malaria-carrying mosquitos never play that rôle. Hence, it is concluded, much of what is done in the way of anti-malarial

measures is wasted effort. Also it would appear that malaria is a disease that does not spread unless a number of special conditions are fulfilled, and is probably to a large extent a "household" disease, and should consequently be dealt with in the houses of the people, even more than in their environment.

Jones (H. L.). **Annual Report of the Chief Health Officer.**—*N. Territ. Australia: Rept. Administrator 1924–25*, pp. 21–23, 2 pls. Melbourne, 1926.

During November and December *Aëdes* (*Culex*) *vigilax*, Skuse, was abundant in the neighbourhood of Darwin; it breeds for preference in salt or brackish water. The unusually heavy infestation was due to the flooding of the mangrove swamps by the high spring tides in November. Large numbers of the larvae of *Culex fatigans*, Wied., and *A. argenteus*, Poir. (*Stegomyia fasciata*, F.) have been destroyed by the application of crude kerosene; the same treatment proved effective in reducing the numbers of *Taeniorhynchus xanthogaster*, Edw. (*Chrysoconops acer*, Theo.). This species may breed in clean water, but has a preference for drainage and polluted water.

Bradley (G. H.). U.S. Bur. Ent. **Observations on the Emergence of *Anopheles* Mosquitoes.**—*Amer. Jl. Trop. Med.*, vi, no. 4, pp. 283–296, 2 pls. Baltimore, Md., July 1926.

During the mosquito breeding seasons of 1921, 1922 and 1924, observations were made on the emergence of Anopheline mosquitos per unit of area at Mound, Louisiana. Two types of nets were placed on the surface of the breeding-places; one was cone-shaped and was suspended by the apex to the overhanging vegetation and attached at the bottom to a hollow float, and the other was a square wire-screen cage. The latter was used where there was no overhanging vegetation and where the water was sufficiently shallow to rest the cage securely on the bottom. The Anophelines captured were *Anopheles quadrimaculatus*, Say, which was taken in the largest numbers, *A. punctipennis*, Say, and *A. crucians*, Wied.

The daily emergence of Anophelines averaged 0·653 per square yard. The nets were placed in areas showing a higher larval rate (determined by larval counts) than is generally found in the breeding-areas of the region. An increase in the number of larvae present was not followed by a proportionate increase in the rate of emergence. This may have been due to scarcity of suitable food in the areas with the increased number of larvae, or to the activities of natural enemies, which would be most likely to concentrate in such places. The females were found to emerge in somewhat greater numbers than the males; this is apparently usual, as is shown in a discussion of the work of previous authors, though at certain times males may predominate or the proportions may be even.

Mühlens (P.), Dios (R. L.), Petrocchi (J.) & Zuccarini (J. A.). **Estudios sobre el Paludismo y Hematologia en el Norte Argentino.** [Studies on Malaria and Haematology in the North of Argentina.]—*Rev. Inst. bacteriológico*, iv, no. 3, pp. 207–357, 2 pls., 65 figs., 6 charts. Buenos Aires, December 1925. [Recd. August 1926.]

The major part of this paper deals with malaria, and the sections on mosquitos are mainly the work of the late Dr. Petrocchi. In the

provinces of Tucuman, Salta and Jujuy malaria is endemic and Anophelines abound ; the six species found in April and May were, in decreasing order of abundance, *A. pseudopunctipennis, A. argyritarsis, A. pictipennis* (*albitarsis*), *A. tarsimaculatus, A. tarsimaculatus* var. *rondoni* (a new record for Argentina) and *A. albimanus* (one individual). *A. pseudopunctipennis* was plentiful in dwellings and latrines, dark and badly ventilated places being preferred. It bites by day as well as by night. Pools near dwellings and stockyards are the preferred breeding-places. Artificially irrigated sugar-cane and rice fields also afford opportunities for the breeding of Anophelines. No larvae were found in ponds covered with *Azolla filiculoides*.

The Anophelines now known from Argentina include the above and three others : *A. annulipalpis, A. bachmanni* and *A. maculipes*. The Culicines collected were *Culex fatigans* (*quinquefasciatus*), *Taeniorhynchus titillans, T. fasciolatus, Psorophora confinnis, P. varinervis, P. posticata, Aëdes argenteus* (*aegypti*), *A. albofasciatus, A. scapularis, Aëdomyia squamipennis, Uranotaenia pulcherrima* and *U. argentina*. *C. fatigans* and *Aëdes argenteus* are abundant. In the course of a journey in October and November to the north-east of Argentina and to Paraguay *Anopheles argyritarsis* was the commonest species in Paraguay. In the north-east of Argentina *A. pictipennis, C. imitator, T. juxtamansoni, Megarhinus* sp. and *Wyeomyia* sp. were seen in addition to some of the Culicines recorded above.

Following the discovery of a case of human trypanosomiasis in Tucuman, specimens of *Triatoma infestans*, Klug, collected in the straw walls of the patient's dwelling, transmitted *Trypanosoma cruzi* to guineapigs.

Smith (R. O. A.). **A simple Method for the Staining and Mounting of Sandflies.**—*Ind. Jl. Med. Res.*, xiv, no. 1, pp. 171–172, 1 pl. Calcutta, July 1926.

The satisfactory determination of the different species of sandflies [*Phlebotomus*] can only be obtained after the hairs have been removed, and the fly cleaned, spread out and fixed under glass, an effective and simple method for doing which is described.

Christophers (S. R.) & Sinton (J. A.). **A Malaria Map of India.**—*Ind. Jl. Med. Res.*, xiv, no. 1, pp. 173–178, 1 map, 43 refs. Calcutta, July 1926.

This map has been based on various surveys and enquiries undertaken in India, the more important of which are referred to in the bibliography. A short general account is given of the incidence of malaria in relation to such factors as topography, rainfall and irrigation in the different areas.

Sinton (J. A.). **A simple Box for Class Demonstration of Mosquitoes and other small Insects.**—*Ind. Jl. Med. Res.*, xiv, no. 1, pp. 235–238, 1 pl. Calcutta, July 1926.

The box described is made from an ordinary glass-bottomed cardboard pill-box, and is so devised as to protect the specimens exhibited and at the same time give the student every opportunity for careful study. Full instructions for making it are given.

Shortt (H. E.), Barraud (P. J.) & Craighead (A. C.). *Conorhinus rubrofasciatus*, **De Geer, and Indian Kala-azar.**—*Ind. Jl. Med. Res.*, xiv, no. 1, pp. 239–242, 3 refs. Calcutta, July 1926.

Experiments are described in which the larval, nymphal and adult stages of *Triatoma* (*Conorhinus*) *rubrofasciata*, DeG., were fed on kala-azar cases and then dissected at intervals of a few days in an attempt to detect the presence of developmental stages of *Leishmania* (*Herpetomonas*) *donovani*. The results were all negative and justify the conclusion that *L. donovani* undergoes no development in *T. rubrofasciata*, and that the latter therefore plays no part in the transmission of kala-azar. Sandflies (*Phlebotomus argentipes*, Ann. & Brun.) were fed on the same cases as controls, and 32·5 per cent. subsequently proved to be infected.

Narayan Rau (M. A.). **Experimental Infection of the Jackal** (*Canis aureus*) **with** *Piroplasma canis*, **Prana and Galli-Valerio, 1895. A Preliminary Note.**—*Ind. Jl. Med. Res.*, xiv, no. 1, pp. 243–244, 2 refs. Calcutta, July 1926.

Piroplasma canis has been successfully introduced into the blood of the south Indian jackal. A similar parasite has been taken in a blood-smear from a wild jackal, so that transmission by ticks appears possible. It is also suggested that the jackal may be a reservoir of the parasite in addition to the usual host, the pariah dog.

Glaser (R. W.). **Further Experiments on a Bacterial Disease of Adult Flies with a Revision of the Etiological Agent.**—*Ann. Ent. Soc. Amer.*, xix, no. 2, pp. 193–198, 4 refs. Columbus, Ohio, June 1926.

In view of the fact that the disease of house-flies [*Musca domestica*] caused by *Staphylococcus muscae* as occurring in nature is not likely to be of much importance in control [*R.A.E.*, B, xii, 180], attempts have been made to increase its virulence and to cause it to take effect earlier in the life of the flies.

The following is the author's summary: The virulence of *Staphylococcus muscae* was not enhanced by successive passages through adult house-flies. Although flies in the larval stage do not develop the disease described, it is possible to infect them by contaminating their environment with the micro-organism. The disease develops subsequently in a certain number of the adults. It is, however, impossible by this procedure to shorten the period from infection to death. Of external contributing factors temperature, and of internal contributing factors age and sex are important, but these do not appear sufficient. Resistance or susceptibility seems to depend on other unknown causes within the body organisation of the insects. A revision of the diagnostic characters of *S. muscae* is appended.

Glasgow (R. D.). **New Intermediary Insect Host Records for the Giant Thorn-headed Worm of Swine.** *Phyllophaga rugosa* **an Intermediary Host, and the Adult Beetle a Carrier.**—*Ann. Ent. Soc. Amer.*, xix, no. 2, pp. 252–254, 2 refs. Columbus, Ohio, June 1926.

The insect hosts previously recorded for the pig tapeworm, *Macracanthorhynchus hirudinaceus*, are *Melolontha melolontha*, L.

(*vulgaris*, F.) and *Cetonia aurata*, L., in Europe, and *Diloboderus abderus*, Berg, in Argentina. The author has obtained encysted larvae of this tapeworm in the adults of *Lachnosterna* (*Phyllophaga*) *rugosa*, Melsh., reared from experimentally infected larvae in the United States.

PILLERS (A. W. N.) & EVANS (A. M.). **A New Larva of** *Oestrus* (*Gastrophilus*) **from Zebras.**—*Ann. Trop. Med. & Parasit.*, xx, no. 3, pp. 263–266, 1 pl. Liverpool, 13th August 1926.

Oestrus meridionalis, sp. n., which is described from the third stage larva, was taken from zebras in Rhodesia.

YORKE (W.) & WRIGHT (W. R.). **The Mosquito Infectivity of** *P. vivax* **after prolonged Sojourn in the Human Host.**—*Ann. Trop. Med. & Parasit.*, xx, no. 3, pp. 327–328. Liverpool, 13th August 1926.

It is claimed by various authors that *Plasmodium vivax*, if maintained in man for a prolonged period, loses its capacity to infect Anophelines [*cf. R.A.E.*, B, xiii, 92]. The experiments here briefly recorded show that a strain of this *Plasmodium* may be preserved and maintains its power to infect *Anopheles maculipennis*, Mg., after 53 or 54 direct passages through man during a period of three and a half years.

SEN (S. K.). **Possibility of Fly Transmission of Rinderpest.**—*Rept. Imp. Inst. Vet. Res., Muktesar 1924–25*, p. 36. Calcutta, 1926.

In experiments to test the possible relation of *Musca domestica*, L., to rinderpest, three kinds of infective material were used, virulent blood, nasal discharge and fresh faeces from infected cattle. When flies fed on these materials were crushed and inserted into pockets prepared beneath the skin of susceptible animals, or saline suspensions of crushed infected flies were inoculated intravenously, about half the animals treated developed rinderpest. The disease was not caused, however, when living flies, at intervals varying from 2 minutes to 4 hours from the time of the infective feed, were brought in contact with wounds, nasal mucous membrane and conjunctiva of susceptible animals, or when infected flies or their faeces were administered orally, so that it would seem that *M. domestica* does not act as an intermediary in the natural transmission of rinderpest.

Linognathus vituli, L., has been suggested as a possible vector of rinderpest owing to the immunological similarity existing between the disease and typhus, transmitted by *Pediculus humanus*, L. Of three animals injected with saline suspensions of infected lice one developed rinderpest. Infected lice placed on healthy animals did not produce the disease.

GURNEY (W. B.) & WOODHILL (A. R.). **Investigations on Sheep Blowflies. Part I. Range of Flight and Longevity. Part II. Notes on Bionomics and Parasites.**—*Dept. Agric., N.S.W.*, Sci. Bull. 27, 28 pp., numerous figs. Sydney, May 1926.

This paper has already been noticed from another source [*R.A.E.*, A, xiv, 73, 91].

Hinds (W. E.). **Department of Entomology.**—*Ann. Rept. Agric. Expt. Stas. Louisiana State Univ. & Agric. & Mech. Coll. 1925*, pp. 19–27, 1 fig. Baton Rouge, La. [1926.]

In the course of this report it is stated that the horn fly [*Lyperosia irritans*, L.] on cattle was effectively controlled or repelled by a spray treatment. One U.S. pint water and ¼ lb. fish-oil soap are heated until the soap is dissolved, 1 U.S. qt. red pine oil is then added and the mixture brought to the boil and emulsified by pumping under pressure. To this emulsion may be added 30 cc. of derrisine liquid or 90 cc. of free nicotine and 250 cc. of creosote. The entire mixture is thoroughly emulsified and forms a stock solution of which 1 part is to be used with 12 of cold water. It is applied to cattle by a barrel pump connected with piping so that two nozzles are placed on each side of a chute through which the cattle are driven. They pass quickly through the solid sheet of spray discharged by the four nozzles, and a large proportion of the flies are hit by the spray before they can take flight.

Illingworth (J. F.). **Observations on *Chrysomyia megacephala* (Fabr.), our Common Blow-fly, in the Orient.**—*Proc. Hawaiian Ent. Soc. 1925*, vi, no. 2, pp. 253–255, 14 refs. Honolulu, July 1926.

The author has found *Chrysomyia megacephala*, F., in Japan, but it was very rarely seen at Yokohama, which is apparently the northern limit of its distribution. In the valley of the Yangtze in central China it is the predominant fly, and it has been enabled to become so by adapting its habits to suit its surroundings. In this part of China it is customary to conserve all human excrement in liquid form in large jars for use on garden and field crops, the jars being kept in the streets. *C. megacephala* breeds in enormous numbers in the jars, and although the larvae are unable to escape from them for pupation, the practice of dipping out the top layer daily to fertilise the soil does away with the necessity. The adult flies swarm on foods exposed for sale in the streets, and sweets are particularly attractive to them, and are commonly used for baiting fly-traps. The abundance and habits of *C. megacephala* doubtless account for the prevalence of such diseases as amoebic dysentery and typhoid ; sputum is also attractive to the flies, and they are probably responsible on this account for the spread of tuberculosis, which is also very general in the country. In 1923 potassium cyanide was employed to control *C. megacephala* in Nanking, a sufficient quantity being placed in each exposed jar in the city to destroy the larvae. This method was fairly effective, but expensive, as the chemical alone cost about £500 for one year. A list of Hawaiian references to *C. megacephala* is given.

Illingworth (J. F.). **The Common Muscoid Flies occurring about Sweet-shops in Yokohama, Japan.**—*Proc. Hawaiian Ent. Soc. 1925*, vi, no. 2, pp. 260–261. Honolulu, July 1926.

The author examined the flies from a number of traps in sweet-shops in Yokohama in June and July 1923 to determine the species present in them and their relative abundance. On 28th June the species, in order of abundance, were *Lucilia caesar*, L., *Calliphora lata*, Coq., *Muscina stabulans*, Fall., *Fannia scalaris*, F., *Sarcophaga fuscicauda*,

Bött., *L. sericata*, Mg., *F. canicularis*, L., *Musca convexifrons*, Thoms., and *Ophyra nigra*, Wied. All these species were bred by the author from tanks containing a fermenting mixture of human excrement, animal manure, and other organic matter, used for fertilising the soil. On 28th July all these flies were more abundant and in the examination of 5,250 specimens *Musca domestica*, L., *Chrysomyia megacephala*, F., and *Anthomyia bisetosa*, Thoms., were also found in small numbers ; *C. lata*, *L. caesar*, *L. sericata* and *Sarcophaga* spp. (mostly *S. fuscicauda*) made up 85 per cent. of the total. The scarcity of *M. domestica* is probably to be accounted for by the lack of suitable breeding-places, as it is apparently unable to breed in the tanks in which the other species breed, and there is very little animal manure elsewhere. The abundance and habits of these Diptera, which fly from the breeding-places to feed on the sweets exposed for sale and to the corners of the sticky mouths of children, go far to explain the high mortality, especially among children, in the summer.

ILLINGWORTH (J. F.). **Notes on** *Sarcophaga fuscicauda* **Böttcher (Diptera).**—*Proc. Hawaiian Ent. Soc. 1925*, vi, no. 2, pp. 262–265, 1 map. Honolulu, July 1926.

Sarcophaga fuscicauda, Bött., is a sub-tropical species widely distributed in the Orient ; originating probably in India or southern Asia, its spread has apparently followed the routes of shipping and railways ; it probably reached Hawaii, where it has been known for about 20 years, from Yokohama. It is everywhere closely associated with man, breeding in almost any form of organic matter, but especially in human excrement, and is undoubtedly an important agent in the dissemination of disease. It is particularly troublesome in North Queensland, extending in diminishing numbers down the coast to Brisbane, and is the most abundant Sarcophagid around habitations in southern Japan and in China as far north as the Yangtze. It has been suggested that *S. fuscicauda* is a synonym of *S. irrequieta*, Wlk., but Dr. G. A. K. Marshall and Major E. E. Austen have examined Walker's type of the latter and do not consider that the species are identical.

ILLINGWORTH (J. F.). **Notes on** *Chrysomyia megacephala* **(Fabr.) (Diptera).**—*Proc. Hawaiian Ent. Soc. 1925*, vi, no. 2, p. 266. Honolulu, July 1926.

Chrysomyia megacephala, F., is a notable example of a pest that extends its distribution by means of shipping. It has been taken in Fiji, where large numbers were seen around bags of dried coconut in 1924, and appears to have spread to the islands since 1913 when the author made considerable collections of flies under similar conditions ; it has also been found in Samoa and the Bonin Islands.

ILLINGWORTH (J. F.). **Distressing Itch from a Moth,** *Euproctis flava* **Bremer, in the Orient.**—*Proc. Hawaiian Ent. Soc. 1925*, vi, no. 2, pp. 267–270, 8 refs. Honolulu, July 1926.

At Yokohama the author suffered from a rash that lasted for several weeks as a result of handling a moth, *Nygmia* (*Euproctis*) *flava*, Brem.,

and learned that the inhabitants of whole villages in the neighbourhood had been temporarily incapacitated by outbreaks of the same species. In China, at Chinkiang, he found that the natives suffered severely from the moths, which flew abundantly to lights and then hid in various places, sometimes getting among bed-clothing ; the virulence of the scattered hairs continued for weeks, even after the disappearance of the moths, and they could only be disposed of by washing everything with which they had been in contact. The literature on the subject of the urticating properties of the hairs of *N. flava* is briefly reviewed ; there is some doubt as to whether the injury caused by the hairs is purely mechanical or chemical, also whether the hairs are produced by the moth or are derived from the cast larval skin in the cocoon and merely carried by it. [In the case of *Porthesia similis*, Fuess., Dr. H. Eltringham has shown (Trans. Ent. Soc. Lond. 1913, pp. 423-427, pl. xxii) that the urticating spikes are swept up from the inner surface of the cocoon by the moth in the hairs of its tail just before it leaves the cocoon.—Ed.]

Morishita (K.) & Tsuchimochi (K.). **Experimental Observations on the Dissemination of Diseases by Cockroaches in Formosa.** [*In Japanese.*]—*Jl. Med. Soc. Formosa*, no. 255. Taihoku, Formosa, June 1926. (With a Summary in English.)

Periplaneta americana, *P. australasiae* and *Dorylaea rhombifolia* are common in dwelling houses in Formosa. In feeding experiments with these cockroaches it was found that the bacteria, *Bacillus typhi*, *B. dysenteriae* and *Vibrio cholerae*, cysts of the protozoon, *Entamoeba pitheci*, and eggs of the helminths, *Ascaris lumbricoides*, *Trichuris trichiura* and hookworms, pass through the digestive tract and are excreted uninjured. If the faeces are deposited in moist places, these organisms retain their vitality for some time and may become the cause of new infection.

Parker (R. R.) & Spencer (R. R.). **Hereditary Transmission of Tularaemia Infection by the Wood Tick,** *Dermacentor andersoni* **Stiles.**—*Public Health Repts.*, xli, no. 28, pp. 1403–1407, 1 ref. Washington, D.C., 9th July 1926.

Further experiments [*R.A.E.*, B, xii, 123] here described have demonstrated the possibility of hereditary transmission of *Bacterium tularense* in *Dermacentor venustus*, Banks (*andersoni*, Stiles). Healthy ticks were fed on animals inoculated with tularaemia. Details of this feeding and that of the subsequent progeny of the ticks are described. Of 15 ticks engorged on infected hosts, 8 transmitted the infection to their progeny. In the case of 2 of these 8. the infection was only recovered from the eggs and not from the resultant larvae or nymphs, but in the remaining ones it was recovered from larvae or nymphs or both. The virulence of the infection appears to vary in the progeny of different females, though all were infected from the same source. Infectivity could not be demonstrated in adult ticks known to be infected as nymphs, but the experiment is not regarded as conclusive. This is believed to be the first record of hereditary transmission of a known bacterium.

Rondelli (M.). **Alcuni Ixodidi della Somalia Italiana.**—*Res biologicae*, i, no. 3, pp. 33–43, 4 figs., 10 refs. Turin, 1926.

The following ticks from Italian Somaliland are additional to those recorded in a previous list [*R.A.E.*, B, iv, 70]: *Rhipicephalus pulchellus humeralis*, subsp. n., which had previously been recorded as *R. ecinctus*, Neum.; *Hyalomma aegyptium impressum*, Koch, and its form *transiens*, Schulze; *H. aegyptium dromedarii*, Koch; and *Amblyomma hebraeum*, Koch. The author regards *A. eburneum*, Gerst., and *A. lepidum*, Dön., as subspecies of *A. hebraeum*.

Rondelli (M.). **Missione zoologica del Dr. E. Festa in Cirenaica. Ixodoidea.**—*Res biologicae*, i, no. 4, pp. 45–58, 3 figs., 19 refs. Turin, 1926.

Ticks hitherto recorded from Cirenaica [*R.A.E.*, B, xi, 60] include *Rhipicephalus sanguineus*, Latr., and *R. bursa*, C. & F. Additional species here recorded are: *Ixodes festai*, sp. n., from a partridge, *Alectoris barbata*; *Hyalomma depressum*, Schulze, from a horse and *Lepus* sp.; *Haemaphysalis cinnabarina punctata*, C. & F.; *H. leachi*, Aud.; and *H. otophila schulzei*, subsp. n.

Poulton (W. F.). **Trypanosomiasis.**—*Uganda Prot.: Ann. Rept. Vet. Dept. 1925*, p. 8. Entebbe, 1926.

Glossina morsitans, Westw., appears to be absent from various places where it was formerly troublesome. Game does not appear to be scarce nor has the bush diminished. Though there is a decrease in the density and extent of the wider fly-belts, the problem of the presence of small foci requires careful and constant investigation; it is considered that motor traffic is tending to cause an extension of the infested area of the West Nile.

Galli-Valerio (B.). **Parasitologische Untersuchungen und Beiträge zur parasitologischen Technik.** [Parasitological Researches and Technique.]—*Centralbl. Bakt., Paras., Infekt.*, Ite Abt. Orig., xcix, no. 4–5, pp. 319–325. Jena, 5th August 1926.

Silver foxes bred in Valais were parasitised by a mite, *Chorioptes vulpis*, Még., and a flea, *Trichopsylla* (*Vermipsylla*) *globiceps*, Tasch. Specimens of *Dermanyssus gallinae*, DeG., taken from fowls, were kept without food at 18°–20° C. [64·4°–68° F.] for 11 days before death ensued.

Hase (A.). **Ueber die Giftwirkung der Bisse von Tausendfüssen.** [On the Toxic Action of Bites of Centipedes.]—*Centralbl. Bakt., Paras., Infekt.*, Ite Abt. Orig., xcix, no. 4–5, pp. 325–332, 4 figs., 27 refs. Jena, 5th August 1926.

A number of experiments are recorded with *Scolopendra cingulata*, Latz., *S. oraniensis lusitana*, Verh., and *Lithobius insignis*, Meig., collected in Spain. The conclusion reached is that the bites of these Myriapods can cause rapid and marked injuries to the skin, but that the symptoms soon disappear without serious after effects.

Richardson (U. F.). **Research Division Annual Report, 1925.**— *Uganda Prot.: Ann. Rept. Vet. Dept. 1925*, pp. 13–16. Entebbe, 1926.

Amakebbe, a disease apparently identical with African coast fever, causes a mortality of 50 per cent. of all the calves born in Uganda. Animals that recover obtain an absolute immunity. Ticks taken from diseased animals produced, under experimental conditions, a disease diagnosed as African coast fever. The age of the calf appears to have some bearing on the course of the disease; calves infected under 4 months old usually recover. Very irregular results were obtained by collecting nymphs of *R[hipicephalus] appendiculatus*, Neum., on infected animals and placing them on susceptible ones after they had moulted.

An experiment was undertaken on the transmission of *Trypanosoma vivax*. Six oxen were placed where *Stomoxys* was very numerous; a few *Haematopota* were also present, but no tsetse-flies [*Glossina*]. An infected animal was kept with the healthy ones for 9 days, when it died. Two of the oxen developed infection 17 days after the introduction of the infected animal, and a third 2 days later. Twenty-four hours after the removal of the infected animals healthy ones were allowed to graze over the same ground, but none of them became infected. The experiment indicates that no cyclical development of the parasite in a local vector was occurring.

Infection with *T. vivax* is not considered to be so serious as was previously supposed; under favourable conditions the animals reach a state of tolerance after 1–2 months, when the disease no longer appears to affect their economic value, and the trypanosomes can only be detected in the blood at rare intervals.

As a result of laboratory observations it is now known that in the case of *T. congolense* also a stage of tolerance may be reached where the infected cattle remain in excellent condition. All strains, though virulent at first, on repeated mechanical passage through cattle have tended towards a mild type of disease that does not lead to death or even debility. This is possibly a result of the repeated mechanical transmission, which is confirmed in nature by the mild type of the disease existing in Zanzibar, where transmission is believed to be only mechanical in the absence of *Glossina*. Should further work confirm these results it will follow that outbreaks in the field showing a heavy mortality must have had recent connection with a cyclically developed strain and probably with tsetse-flies.

This would also support the suggestion of Hutchins [*R.A.E.*, B, xii, 183] that the prevalence of serious outbreaks of trypanosomiasis in Buganda and their relative absence in the Eastern Province might be due to small undetected foci of *Glossina* in Buganda Province and the absence of similar foci in the Eastern Province.

Attempts to infect animals with a virulent strain of *T. congolense* when they had become tolerant to a mild one have not been successful, suggesting the possibility of immunising cattle so that they can live and even work in areas infested by *Glossina*.

T. congolense is recorded from dogs that showed no sign of the disease until over a year after infection. It is possible that such dormant infection in dogs is more common than was supposed, and that when these animals are used for hunting in areas where *Glossina* is present, they might be responsible for carrying a cyclically transmitted strain back to cattle stationed outside the fly areas, and thus causing a

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serious outbreak of the disease by mechanical spread through the agency of local biting flies. The strain taken from one dog proved fatal through two sub-inoculations to cattle and then assumed the mild type.

The Dipping of Sheep.—*Jl. Dept. Agric. S. Australia*, xxix, no. 11, pp. 965–968. Adelaide, 15th June 1926.

This paper, prepared by the Stock and Brands Department of South Australia, deals with the essential points of dipping, the action of arsenical dips, and the importance of employing careful methods in handling the dips and the sheep.

GUYTON (F. E.). **Preliminary Report on Sodium Fluoride as a Control for Cattle Lice.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 602–603. Geneva, N.Y., August 1926.

Sodium fluoride and nicotine dust were tested as a control for lice on cattle that were otherwise in excellent condition. All those treated with the nicotine dust showed infestation 8 days after treatment, but as the sodium fluoride seemed promising and left no bad effect, it was tried on the entire herd, and resulted in only a few living lice being found on a few of the most heavily infested animals the day after treatment, while examination two months later showed none living. The animals were badly infested before treatment, and the sodium fluoride was applied to the neck, shoulders and rump by means of a small tin shaker, after which it was rubbed into the hair by the naked hand. One ounce of dust was used for each animal, one man treating 40 in an hour. The lice present were *Trichodectes scalaris* (biting louse of cattle), *Haematopinus eurysternus* (short-nosed ox louse) and *H. vituli* (long-nosed ox louse).

PARMAN (D. C.). U.S. Bur. Ent. **A Brief History of the Sticktight Flea and the Fowl Tick in the United States.**—*Jl. Econ. Ent.*, xix, no. 4, pp. 644–648. Geneva, N.Y., August 1926.

The probable origin and spread of *Echidnophaga gallinacea*, Westw. (sticktight flea) and *Argas persicus*, Oken (*miniatus*, Koch) (fowl tick) are discussed, with notes on their bionomics. These two pests have spread throughout the tropical and subtropical parts of the world, having largely followed the extension of the domestic hen, and are the cause of enormous losses every year. In the United States the tick is established from Florida to California, and as far north as Oklahoma, and the flea from South Carolina to California, and as far north as Kansas and Missouri. Outbreaks of the flea are rather sporadic, entire flocks of fowls having been destroyed in a few weeks, while losses from the tick are less violent but are continuous and very heavy. In view of the great value of poultry products in the United States (estimated at considerably over £200,000,000 in 1920) these parasites are considered to be potentially two of the most serious imported pests, and their control is a problem of national concern.

JEPSON (F. P.). **House Flies and their Connection with Manuring Operations on Estates in Ceylon.**—*Ceylon Dept. Agric.*, Bull. 74, 16 pp., 7 pls. Peradeniya, May 1926.

This paper is a fuller account of an investigation on which a brief report has been noticed [*R.A.E.*, B, xiv, 93]. The cages in which flies

were bred from samples of manures are described. The following flies were bred from artificial manure : *Musca yerburyi*, Patton, *M. nebulo*, F., *Stomoxys calcitrans*, L., *Ophyra nigra*, Wied., and *Chrysomyia megacephala*, F. Only the first two species are concerned in the swarms that invade bungalows, *M. yerburyi* being probably the commoner. In order to study the life-history of *M. yerburyi* and *M. nebulo*, which could not be distinguished from each other while alive, mating couples were placed in separate lamp chimneys provided with sugar solution for food and moistened blood meal for oviposition, and the progeny of each female was reared separately, so that its identity was known as soon as the parents had been identified. The life-history of the two species was very similar ; mating took place from 5 to 7½ days after emergence, and oviposition from 1 to 10 days later, the usual time between mating and oviposition being 4 days. The eggs were laid in batches, usually in a depression in the food substance ; each female laid about 100 eggs, not more than 50 per cent. of which produced adults. The eggs hatched in from 16 to 20 hours, and the larvae immediately began to feed ; the larval period was 6 to 12½ days for *M. yerburyi* and 7 to 11 days for *M. nebulo*. Pupation took place on the surface of the food, although the opportunity to pupate in sand was given, and the adults of *M. yerburyi* emerged in 4½ to 7½ days and those of *M. nebulo* in 5½ to 8 days, the total time from oviposition to the emergence of the adults being 12½ to 19 days for the former (368 individuals) and 13¾ to 20 days for the latter (72 individuals). The life-history experiments were conducted at room temperature, averaging 75° F. Most of the adult flies lived for a month in captivity, and many lived for 7 weeks.

ALLNUTT (E. B.). **Some Experiences in the Control of Fly-breeding.**— *Jl. R.A.M.C.*, xlvii, no. 2, pp. 105–120, 1 fig., 4 refs. London, August 1926.

In Bermuda the great importance of horse manure for agricultural purposes makes it necessary to devise some means of preventing the breeding of house-flies, *Musca domestica*, L., in it without detracting from its value as a fertiliser. After various trials a method was found that was satisfactory from all points of view and is now in use.

Rectangular walled enclosures open at the top and on one side, measuring about 6 by 5 feet in area, and 4 to 5 feet in height, were in use for the storage of manure ; these enclosures, which were built of limestone, were adapted at a comparatively small cost. Each was divided into two by a partition wall, and the whole was cemented to cover up cracks and holes ; the front of each stall thus made was fitted with a sliding wooden shutter that could be removed easily. A gutter with overhanging edges, constructed on Baber's principle [*R.A.E.*, B, xiv, 25], was carried along the front of the stone platform on which the walls stood ; this gutter, which ran into a sump, had a lip 2 inches high at the lower end in order to retain water in it.

Each day manure is placed in one stall and packed firmly against the back and side walls ; the close-packed mass quickly begins to ferment and reaches a temperature fatal to fly larvae ; the outside of the heap should be raked off and placed in the middle every two days. Each stall contains the manure of one horse, and is filled in about ten days, after which the heap in it is allowed to stand for ten days while the adjoining stall is used. During dry weather, it is necessary to water the

manure daily before beating it down. To render the stored manure unattractive to flies, the heap may be covered with oiled earth, or with straw or litter, which is then burned, leaving a coating of ash.

A certain amount of fly breeding takes place in manure even when carefully packed, but the larvae are unable to reach the earth for pupation, and die ; larvae that crawl out of the front of the enclosure, which they are enabled to do by the fact that the wooden shutters are prevented by small stops from touching the ground, fall into the gutter, where they are killed by the water, which contains cresol ; an overhanging edge at the top of the walls prevents larvae that succeed in ascending them from escaping.

In Bermuda under the most favourable conditions of temperature (90° F.) and humidity (90–100 per cent.), which occur in August and September, flies emerge 12 days after the eggs are laid. The larvicidal effects of high temperatures are discussed ; they vary somewhat according to the stage of larval development. The length of time necessary for the storage of fermenting manure in order that it shall not subsequently be suitable for fly breeding depends on the closeness with which it is packed and on climatic conditions ; tightly packed manure reaches the required degree of fermentation in approximately half the time taken by loosely stacked manure. Under the least favourable conditions storage for ten days was sufficient for tightly packed and well watered manure.

Other methods of preventing fly breeding in manure that were tried and abandoned for various reasons are discussed.

[Dryenski (P.).] **Дрѣнски (P.). Parasitic Flies of the Family Pupipara (Diptera) in Bulgaria.** [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, iii, pp. 89–104, 7 figs. Sofia, 1926. (With a Summary in German.)

The following species are recorded from Bulgaria : *Hippobosca equina*, L., *H. equina canina*, subsp. n. (mainly on dogs), *Olfersia ardeae*, Macq., *Ornithomyia avicularia*, L., *Stenopteryx hirundinis*, L., *Crataerhina* (*Oxypterum*) *pallida*, Latr., *Lipoptena cervi*, L., and *Melophagus ovinus*, L. A key to the species and brief descriptions and figures are given.

Jobling (B.). **A Comparative Study of the Structure of the Head and Mouth Parts in the Hippoboscidae (Diptera Pupipara).**—*Parasitology*, xviii, no. 3, pp. 319–349, 5 pls., 4 figs., 25 refs. Cambridge, September 1926.

This paper deals with Hippoboscids in general, and with *Pseudolynchia* (*Lynchia*) *maura*, Bigot, and *Melophagus ovinus*, L., in particular. *M. ovinus* was experimentally fed on man, the method and effects of feeding being described.

Austen (E. E.). **On the Genus of *Crataerhina*, von Olf., and its Allies (Diptera Pupipara—Family Hippoboscidae), with Descriptions of New Species.**—*Parasitology*, xviii, no. 3, pp. 350–360, 1 pl., 1 fig., 4 refs. Cambridge, September 1926.

Keys are given to the genera *Stenopteryx*, *Brachypteromyia*, *Myophthiria*, and *Crataerhina*, and to the species of the last named ; these include four new ones taken from swifts in various parts of the world.

Bayon (H. P.). *Herpetomonas* **in the Cloaca of African Chameleons.**—*Parasitology*, xviii, no. 3, pp. 361–362, 1 fig., 2 refs. Cambridge, September 1926.

Previous records of *Herpetomonas* in chameleons are briefly reviewed. Their presence in great numbers in the cloaca of all chameleons examined by the author and their occurrence in widely separated parts of Africa indicate that they are true parasites of these lizards. Their life-history and the manner in which the chameleons become infected are still to be determined.

Mandoul (A. H.). **Présence à Bordeaux de** *Culicoides perpungens*.—*Ann. Parasit. hum. & comp.*, iv, no. 4, pp. 319–322, 2 figs., 2 refs. Paris, 1st October 1926.

Culicoides perpungens, Kieff., is recorded from Bordeaux as attacking man.

Cousin (G.). **Sur le retard de la nymphose. La limite extrême du jeûne et la réalimentation possible des larves de** *Calliphora erythrocephala*.—*C. R. Soc. Biol.*, xcv, no. 27, pp. 601–603, 2 refs. Paris, 21st September 1926.

Further experiments with the larvae of *Calliphora erythrocephala*, Mg. [*R.A.E.*, B, xiv, 169] have shown that, at a temperature of 18–20° C. [64·4–68° F.], pupation occurs 3–4 days after the last larval feed, provided that the larvae can burrow into dry earth.

Various external factors may lengthen this pre-pupal stage, details of which are to be dealt with later. When deprived of food, even quite young larvae will prepare for pupation, but if provided with food during the pre-pupal stage, they will begin feeding again, thus postponing pupation. Older larvae cannot be induced to resume feeding once they have entered the pre-pupal stage.

Nakamura (M.). **On a Fly in the Alimentary Canal of Man.** [*In Japanese.*]—Dobuts. Zasshi [*Zool. Mag.*], xxxviii, no. 453, pp. 211–212. Tokyo, July 1926.

Some eggs and larvae of *Sarcophaga carnaria*, L., were excreted by a man who was suffering from disturbances of the digestive system.

Bezzi (M.). **Sulla posizione sistematica del genere di "Estridi"** *Anthophasia* **(Dipt.).** [The Systematic Position of the Genus *Anthophasia*.]—*Atti Soc. ital. Sci. nat. Mus. Civ. Stor. nat. Milano*, lxv, no. 1, pp. 1–5, 16 refs. Milan, June 1926.

The author considers that the Oestridae are not a distinct family, but an artificial collection of genera.

[Nasonov (N.).] **Насонов (Н.). Le** *Phlebotomus papatasi* **(Scop.) et la fièvre de trois jours (febris papataci) en Crimée.**—*C. R. Acad. Sci. U.R.S.S.*, 1926 A, pp. 53–55, 11 refs. Leningrad, 1926.

In 1924–26 all the sandflies collected at Sevastopol were identified as *Phlebotomus papatasii*, Scop., a vector of sandfly fever. In all parts of the Crimea in which this fever occurs, new-comers are the first to be attacked.

[Shtefko (V. G.) & Minkevich (I. S.).] **Штефко (В. Г.) и Минкевич (И. С.). The Transmitter of Sandfly Fever in the Crimea.**—*Phlebotomus crimicus*, **sp. n.** [*In Russian.*]—*Profilakt. Med.*, ii, no. 9–10, pp. 49–53, 4 refs. Kharkov, 1923. [Recd. September 1926.]

Phlebotomus crimicus, sp. n., is described from the Crimea as the vector of sandfly fever. A table is given comparing it with *P. caucasicus*, Marz.

Patton (W. S.). **Blood-sucking Arthropods of Medical and Veterinary Importance in China.**—*China Med. Jl.*, xl, nos. 6 & 7, pp. 543–553 & 603–612. Shanghai, June & July 1926.

This is a general discussion of blood-sucking Arthropods, very little being known of those occurring in China. Among those recorded are *Phlebotomus major* var. *chinensis*, *P. sergenti* and *P. sinensis*, the first of which is regarded as the possible carrier of the parasite of kala-azar in China; a rich Simuliid fauna, which has not been studied; *Tabanus ditaeniatus* and another large species of this genus; *Musca domestica*, which occurs in north China and is probably replaced in the South by some Oriental species; *Stomoxys calcitrans*, a species of *Haematobia*, *Haematobosca perturbans*, and *Lyperosia exigua*, all of which bite cattle; *Lucilia sericata*, which is the common blowfly, and *Chrysomyia megacephala*; *Oestrus* (*Gastrophilus*) *intestinalis*, infesting horses, and *Cephalopsis titillator*, attacking camels and dromedaries; *Hippobosca francilloni* (the common dog-fly); the fleas, *Tunga lagrangei*, parasitic on the rat in Shanghai, and allied to the better known *T.* (*Dermatophilus*) *penetrans*, which, however, does not occur in China, *Xenopsylla cheopis* and *Ceratophyllus anisus*, common on house rats in north China, *Ctenocephalus canis* (dog flea), *C. felis* (cat flea) and the human flea [*Pulex irritans*]; *Cimex lectularius* in North China and *C. hemiptera* in South China; and the lice, *Pediculus humanus* (*vestimenti*) and *P. capitis*, and, less commonly, *Phthirus pubis*. Notes are given on the collection and preservation of Arthropods.

Gaschen (H. L.). **Contribution à l'étude de la Flagelliase des Euphorbiacées en Suisse.**—*Mém. Soc. vaud. Sci. nat.*, ii, no. 5, pp. 317–351, 4 figs., 95 refs. Lausanne, 17th March 1926.

Stenocephalus agilis, Scop., is the intermediary host of *Herpetomonas* (*Leptomonas*) *davidi*, which causes flagellosis of Euphorbiaceae in Valais and Vaud. In the course of his investigations the author found *Herpetomonas pyrrhocoris* and *H. scatophagae* in *Pyrrhocoris apterus*, L., and *Scatophaga stercoraria*, L., and *H. lygaei*, which has not previously been observed in Switzerland, in *Lygaeus saxatilis*, Scop. A Muscid larva was found in *S. agilis*.

Aubertot (M.). **La Flagellose des Euphorbes dans la Haute-Maurienne.**—*Ann. Soc. linn. Lyon*, lxxii (1925), pp. 36–41, 2 figs., 9 refs. Lyons, 1926.

Flagellosis of *Euphorbia cyparissias*, due to *Herpetomonas* (*Leptomonas*) *davidi*, was found in about 25 per cent. of the plants examined

Large numbers of *Lygaeus saxatilis*, Scop., were also seen, and in about 20 per cent. of the insects examined a species of *Herpetomonas* was found in the alimentary canal.

Drbohlav (J. J.). **The Cultivation of** *Herpetomonas muscarum* **(Leidy 1866) Kent 1881 from** *Lucilia sericata*.—*Jl. Parasit.*, xii, no. 4, pp. 183–190, 2 pls., 11 refs. Urbana, Ill., June 1926.

Of 300 specimens of *Lucilia sericata*, Mg., 250 were found to be infected with a *Herpetomonas*, which, in view of Becker's and the author's own experiments [*R.A.E.*, B, xii, 26; xiii, 173], is considered to be *H. muscae-domesticae* (*muscarum*).

The parasites were limited to the lumen of the alimentary tract of the flies, the first part of the intestine, in which flagellate forms predominated, being most heavily infected; in the posterior part of the intestine and the rectum rounded forms predominated. No organisms were found in the cells of the intestine or in the eggs, ovary or other organs, and attempts to obtain cultures from these tissues were negative, indicating that the organism is not commonly transmitted through the egg of the fly.

Uribe (C.). *Crithidia ortheae* **n. sp. from Reduviids of the Genus** *Orthea*.—*Jl. Parasit.*, xii, no. 4, pp. 199–202, 2 pls., 2 refs. Urbana, Ill., June 1926.

The intestinal contents of numbers of two Reduviids, *Orthea bilobata*, Say, and *O. vincta*, Say, from *Euphorbia pilulifera* in Venezuela, were examined, and about 10 per cent. of *O. bilobata* were found to be heavily infected with a flagellate, while three specimens of *O. vincta* out of 45 were slightly infected with the same parasite. Parasites were never found in the oesophagus, but flagellate forms occurred in the crop or first stomach, and both flagellate and aflagellate forms in the posterior part of the intestine or second stomach and in the rectum, in large numbers. In several stained films *Leishmania*-like bodies were found in the interstices of the epithelial cells, and in one instance they seemed to be intracellular. The forms of the parasite observed are described, and the name *Crithidia ortheae* is proposed for it. Attempts to make cultures and to inoculate animals gave negative results.

Uribe (C.). **A New Invertebrate Host of** *Trypanosoma cruzi* **Chagas.**—*Jl. Parasit.*, xii, no. 4, pp. 213–215, 1 fig. Urbana, Ill., June 1926.

Among some living specimens of the Reduviid, *Rhodnius prolixus*, Stål, collected in Venezuela, was an adult female of another bug of this family, *Apiomerus pilipes*, F., which attacked them, sucking the blood-meal with which they were distended through a hole pierced in the membrane between two dorsal abdominal segments, and killing them. This specimen was kept alive in the laboratory for 17 days, during which time it fed on *R. prolixus* and on house-flies, *Musca domestica*, L.; it refused to suck blood from newly born rats or from man. The intestinal contents of the dead *R. prolixus* were found to be heavily infected with *Trypanosoma cruzi*, and identical parasites were present in very large numbers throughout the intestinal tract of *A. pilipes*, but no flagellates were found in the faeces of the latter. The dead house-flies were also examined, but contained no flagellates.

[Pavlovskiĭ (E. N.).] **Павловский (Е. Н.). The Epidemiology of Helminthic Diseases.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, v, pt. 3, pp. 125–132. Saratov, 1926. (With a Summary in English, p. 229.)

The pathogenic helminths recorded in Russia include *Dipylidium caninum*, occurring in the dog and cat, and occasionally transmitted to man by the ingestion of *Trichodectes canis*, Retz., or fleas; *Filaria bancrofti*, transmitted by mosquitos; and *Loa extraocularis*. The transmitting agent of the last-named is not known.

[Gaĭskiĭ (N. A.) & Alfionov (S. L.).] **Гайский (Н. А.) и Алфионов (С. Л.). An Outbreak of Pneumonic Plague at Baikodam of the Sandy Region of the Kirgiz Steppe.** [*In Russian.*] —*Rev. Microbiol. & Epidémiol.*, v, pt. 3, pp. 133–136. Saratov, 1926. (With a Summary in French, pp. 229–230.)

An outbreak of pneumonic plague that occurred during 1926 in the Ural government was traced to mice, and was apparently the result of direct contagion. Of 114 fleas taken on man, 112 were *Pulex irritans*, L., and two were *Ctenocephalus felis*, Bch.

[Suvorov (S. V.).] **Суворов (С. В.). Experimental Disinfection of Plague-infected Dwellings with Chlorine Gas and Carbon Dioxide.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, v, pt. 3, pp. 143–145. Saratov, 1926. (With a Summary in German, p. 232.)

Chlorine gas may be used in any kind of dwelling as a fumigant against plague infection and fleas, and it acts more quickly and better than other fumigants, such as sulphur, in places that cannot be hermetically sealed. The experiments were made in dwellings of different types, including wooden structures and mud huts. Though fleas were abundant, they were successfully exterminated when the gas was used at the rate of 6–10 lb. per 1,500 cu. ft. Clothing and furs are not injured if perfectly dry.

[Veshchezerov (N. I.).] **Вещезеров (Н. И.). The Natural and Artificial Infection of *Anopheles* with Malaria Plasmodia in the Adler Region.** [*In Russian.*]—*Rev. Microbiol. & Epidémiol.*, v, pt. 3, pp. 153–160, 1 pl., 2 refs. Saratov, 1926. (With a Summary in German, pp. 233–235.)

In order to ascertain the percentage of infection of Anophelines on the Black Sea coast of the Caucasus, mosquitos were taken exclusively from houses known to contain malaria infection. They were kept in captivity for at least five days, so that sufficient time was allowed for the development of easily recognisable oocysts. By this method it was found that the highest percentage of malaria infection in Anophelines (mostly *Anopheles maculipennis*) varied from 3·8 to 11·3 per cent., with an average of 6·7 per cent. The number of infected mosquitos varied according to the prophylactic measures employed; in one group of houses the infection was reduced from 20 to 7·14 per cent. as a result of one month's quinine prophylaxis.

Experiments were also made with artificially infected mosquitos, bred individuals being used. The unfertilised females could only be induced to feed with great difficulty, and the majority died without

feeding. Of nine *A. maculipennis* fed on patients infected with *Plasmodium praecox*, oocysts were found in four on the seventh day or after. In one individual examined on the 14th day sporozoites were found in the salivary glands. Two *A. bifurcatus*, L., included in these experiments were examined on the eighth and ninth day respectively and contained oocysts. Experiments with *P. vivax* were inconclusive, and infection with *P. malariae* was not obtained in any of ten mosquitos.

Uchida (S.). **Studies on Amblycerous Mallophaga of Japan.**— *Jl. Coll. Agric. Imp. Univ. Tokyo*, ix, no. 1, pp. 1–56. Tokyo, August 1926.

Sixty-three species of Mallophaga, of which 17 are new to science, are recorded from Japan, with notes on their hosts.

Waterston (J.). **The Mallophaga and Anoplura and their Host-relations.**— *Verh. III. Internat. Ent.-Kongr. Zürich, 1925*, ii, p. 576. 1926.

Only the summary of this paper is given. The points emphasised are: The constancy of the relations between parasite and host, a parasite being often restricted to a family, a tribe, or even a genus of hosts; and the fact that the Mallophaga have undergone a retarded evolution, with the result that they now form a valuable index to the phylogeny of their hosts.

Jordan (K.). **On *Xenopsylla* and allied Genera of Siphonaptera.**— *Verh. III. Internat. Ent.-Kongr. Zürich, 1925*, ii, pp. 593–627, 16 figs., 4 pls. 1926.

This paper contains a brief revision of the fleas allied to *Xenopsylla cheopis*, Rothsch., the most important vector of bubonic plague.

[Samsonov (P. F.).] **Самсонов (П. Ф.). Persian Relapsing Fever in Central Asia.** [*In Russian.*]—*Turkestansk. Med. Jl.*, iv, no. 5, pp. 249–264, 8 charts, 15 refs. [Tashkent] 1926.

The existing literature on Persian relapsing fever is reviewed at length, the work of foreign authors being compared with records from Central Asia. The causal agent, *Spirochaeta persica*, is transmitted by *Ornithodorus lahorensis*, Neum. (*tholozani*, Lab. & Mégn.), as has recently been conclusively proved by N. I. Latuishev's experiments with ticks obtained from Turkestan.

Nicolle (C.) & Anderson (C.). **Fièvre récurrente transmise à la fois par Ornithodores et par Poux. Etude expérimentale de la récurrente espagnole.**—*Arch. Inst. Pasteur Tunis*, xv, no. 3, pp. 197–228, 7 charts, 4 refs. Tunis, 1926.

This is an amplified account of observations of which a preliminary notice has appeared elsewhere [*R.A.E.*, B, xiv, 168]. The authors discuss the different types of relapsing fever, the African type transmitted by *Ornithodorus moubata*, Murr., that occurring in Venezuela, transmitted by *O. venezuelensis*, and European relapsing fever, transmitted by lice [*Pediculus*]. The transmission of Spanish relapsing fever, with examples of *O. marocanus*, Velu, from Spain, was proved

by experiments on a monkey and on guineapigs, the infected monkey being used for infecting other ticks. Both adults and nymphs of *O. savignyi*, Aud., fed on it failed to transmit the disease to healthy animals by feeding on them, but spirochaetes were found in their blood ten days after a subcutaneous injection of crushed ticks (adults and nymphs). With regard to the transmission of the Spanish virus by lice, it was found that the development and localisation of the spirochaetes in the louse are identical with those of the spirochaetes causing relapsing fever in North Africa. In both cases the spirochaetes are invisible to the ultramicroscope in the hours immediately following an infective feed. They disappear permanently from the digestive tract, so that the disease cannot be transmitted by the bite to other animals. Having penetrated through to the general cavity, they disperse throughout the body fluid, and are liberated by the slightest injury to the louse (the crushing of one leg is sufficient). Unlike the virus of the European form, that of the Spanish form never regains a visible stage ; as has already been shown [*R.A.E.*, B, iii, 59], the spirochaetes of relapsing fevers are pathogenic during their invisible stage.

Experiments with various laboratory animals are described.

Senevet (G.) & Rossi (P.). *Ixodes ricinus*, **Tique des régions froides ou tempérées.**—*Bull. Soc. Path. exot.*, xix, no. 7, pp. 558–560, 3 refs. Paris, 1926.

The scarcity of adults of *Ixodes ricinus*, L., during the hot weather in Algeria suggests that it is a tick adapted to cold or temperate regions, which hypothesis is borne out by its geographical distribution, here summarised after Nuttall and Warburton.

[Olenev (N. O.).] **Оленев (Н. О.). The Question of the uneven Distribution of Piroplasmosis of Cattle in the North-Western Region.** [*In Russian.*]—Vestnik Sovrem. Veterinarii [*Herald Current Vet. Sci.*], ii, no. 6, pp. 15–17, 1 map. Moscow, June 1926.

The distribution of piroplasmosis of cattle in north-western Russia (Novgorod, etc.) appears to be in direct relation to the humidity of the pasture lands concerned. Recent observations have shown that this is due to the prevalence of ticks, *Ixodes ricinus*, L., under such conditions. The effect of temperature and humidity on their development as observed under artificial conditions is discussed.

Doherty (A. G.). **East Coast Fever.**—*Kenya : Ann. Rept. Dept. Agric. 1925*, pp. 60–62. Nairobi, 1926.

The methods recommended for the control of African coast fever are tick destruction and the strict enforcement of regulations concerning the movement of cattle ; the application of these measures differs in different parts of the country ; in undulating country with moist and sheltered valleys, where conditions are suitable for uninterrupted tick breeding, dipping at three or five day intervals and fencing would be necessary, while in open country with a light rainfall, dipping at seven or ten day intervals should be sufficient. Sudden temporary climatic changes can render an area normally free from the disease, suitable for the rapid increase of ticks, so that if an infected animal is introduced into the locality sufficient tick larvae will become infected to cause a serious epidemic unless regular dipping is practised.

Bevan (Ll. E. W.). **Red-water and Gall-sickness of Cattle from the Laboratory and Practical Point of View.**—*Rhodesia Agric. Jl.*, xxiii, no. 9, pp. 823–830. Salisbury, September 1926.

A brief historical account is given of redwater of cattle, caused by *Piroplasma bigeminum*, with notes on the ticks that transmit it in Rhodesia, the blue tick [*Boophilus annulatus decoloratus*, Koch], which is probably the most important, the brown tick [*Rhipicephalus appendiculatus*, Neum.] and the red-legged tick [*R. evertsi*, Neum.], and their control by dipping. The term gall-sickness is properly applied to the disease caused by *Anaplasma centrale* and *A. marginale*, which have life-histories similar to that of *P. bigeminum*, being ingested by ticks and passed on through the eggs to their progeny, but it is also applied to ailments due to other causes [*cf. R.A.E.*, B, xi, 72]. The great importance of these diseases in Rhodesia lies in the fact that until they are under control it will not be possible to improve the local cattle ; although the native cattle in tick-infested districts acquire immunity, they are small and slow to mature, and those reared in tick-free districts are almost as susceptible to infection as imported animals when they enter infested districts.

Imes (M.). **Cattle Lice and how to eradicate them.**—*U.S. Dept. Agric.*, Farmers' Bull. 909 revd., 24 pp., 14 figs. Washington, D.C., April 1925. [Recd. October 1926.]

This is a revised edition of a bulletin previously noticed [*R.A.E.*, B, vi, 153].

Blair (K. G.). **Entomological Notes with the Cancer Field Commission in the Trentino, 1925.**—*Jl. Trop. Med. & Hyg.*, xxix, no. 16, pp. 294–298, 2 figs. London, 16th August 1926.

The insects recorded as injurious to man and animals observed during the work of this commission, and particularly those having any possible relation to cancer, have been noticed elsewhere [*R.A.E.*, B, xiii, 58 ; xiv, 20, etc.].

Herfs (A.). **Oekologische Untersuchungen an *Pediculoides ventricosus* (Newp.) Berl.** [Ecological Investigations on *P. ventricosus*.]—*Zoologica*, xxviii, no. 74, pp. 1–68, 1 pl., 1 fig., 14 tables, 5 pp. refs. Stuttgart, 1926.

This paper, which is noticed more fully elsewhere [*R.A.E.*, A, xiv, 564], gives an account of extensive observations on the bionomics and particularly the method of reproduction in *Pediculoides ventricosus*, Newp., as a parasite of various insect larvae. This mite has often been recorded as causing dermatitis in man, but though many workers were concerned in the author's experiments, none of them became infested.

Chapin (E. A.). **A new *Paederus* (Coleopt. : Staphylinidae) causing Vesicular Dermatitis in Man.**—*Arch. Schiffs- u. Trop.-Hyg.*, xxx, no. 9, pp. 369–372, 13 refs. Leipzig, 13th September 1926.

A Staphylinid, *Paederus irritans*, sp. n., is described from Ecuador, where it is responsible for vesicular dermatitis in man.

DA MATTA (A.). **Dermatite produsida por larvas tartaranas ou lagarta de fogo.** [Dermatitis produced by the Larvae of *Megalopyge lenata*.] —*Bol. Inst. bras. Sciencias*, ii, no. 7, pp. 255–262, 2 figs. Rio de Janeiro, 15th July 1926.

An account is given of cases of severe dermatitis in Brazil due to contact with the caterpillars of *Megalopyge lenata*.

HASSELMANN (G.). **Os Poecilideos do Brasil na suppressão natural do mosquito.** [The Poeciliid Fish of Brazil in the Biological Control of Mosquitos.]—*Bol. Inst. bras. Sciencias*, ii, no. 7, pp. 262–265, 1 fig. Rio de Janeiro, 15th July 1926.

Phalloceros caudomaculatus, belonging to the same family as *Gambusia affinis*, is stated to be a useful fish for destroying mosquito larvae, which it prefers to any other food. It frequents the edges of collections of water, thrives at temperatures between 10° and 24° C. [50°–75·2° F.], is very prolific and is viviparous.

ALDRICH (J. M.). **What is** *Oestrus nasalis* **Linnaeus?**—*Insecutor Inscitiae Menstruus*, xiv, no. 1–3, pp. 15–16. Washington, D.C., January-March 1926.

In the author's opinion *Oestrus* (*Gastrophilus*) *nasalis*, L., is the correct name for the horse bot fly, rather than *O.* (*G.*) *veterinus*, Clark.

DYAR (H. G.). **A Note on** *Phalangomyia* **Dyar & Knab (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus*, xiv, no. 1–3, pp. 41–43. Washington, D.C., January–March 1926.

The systematic position of *Phalangomyia* is discussed, this subgenus now contains the two species, *Culex* (*P.*) *debilis*, D. & K., from Peru, and *C.* (*P.*) *articulatus*, Philippi, from Chile. With the extreme aridity known to be prevalent on the west coast of South America, the occurrence of *Psorophora* and *Aëdes*, which pass the dry periods, even of several years' duration, in the egg stage upon the ground, is reasonable. Possibly *Phalangomyia*, peculiar to this region, behaves in a similar manner, contrary to the rule in *Culex*.

DYAR (H. G.). **The Larva of** *Dendromyia intonca* **Dyar & Knab (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus*, xiv, no. 1–3, pp. 43–44. Washington, D.C., January–March 1926.

The usual habitat of the Sabethid, *Dendromyia intonca*, D. & K., in Panama, is the wild pineapple, *Ananas magdalenae*, its occurrence in *Tillandsia* being apparently abnormal.

KOMP (W. H. W.). **A New** *Culex* **from Honduras.**—*Insecutor Inscitiae Menstruus*, xiv, no. 1–3, pp. 44–45. Washington, D.C., January–March 1926.

Culex (*Choeroporpa*) *opisthopus*, sp. n., is described from Honduras.

Mayne (B.). **Report of a Survey to determine the Malaria Prevalence in the Okefenokee Swamp.**—*Pub. Health Repts.*, xli, no. 32, pp. 1652–1660, 1 map. Washington, D.C., 6th August 1926.

A survey of a swamp that covers about 660 sq. miles in southern Georgia and northern Florida confirmed the absence of malaria there. *Anopheles crucians* was the only species of mosquito found. In a survey of the settled area surrounding the swamp similar conditions were generally observed, though in some places *A. quadrimaculatus* was also present in small numbers. In one mill-town malaria was reported to be serious, and the percentage of *A. quadrimaculatus* in this district was much higher.

Myers (G. S.). **Fishes and Human Disease.**—*Fish Culturist*, v, no. 4, pp. 27–29. Philadelphia, Pa., December 1925. [Recd. September 1926.]

The value of fish in mosquito control is briefly reviewed, with particular reference to Guayaquil, where the last remaining yellow fever mosquitos [*Aëdes argenteus*, Poir.] were exterminated by the use of *Lebiasina bimaculata*, *Dormitator latifrons* and *Lebistes reticulatus* in domestic water-containers. Species of *Gambusia* and *Panchax* (*Haplochilus*) *panchax* are very largely used wherever conditions are favourable, and apparently always with success. The bottom-feeding catfish, *Astroblepus* (*Arges*) of the Andes, is a ravenous mosquito feeder at night and has been much used in Peru. A species that seems to have been overlooked in this connection is the Poeciliid, *Rivulus*, common throughout tropical America, which is undoubtedly an important factor in mosquito control in the jungle, as it can travel overland and is found in every little mud-hole and hoof-print and in the leaves of floating aquatic plants.

Brèthes (J.). **Description provisoire de deux espèces nouvelles d'Anophelinae argentins.**—*Prensa med. argentina*, xiii, no. 3, p. 106. June 1926. (Abstract in *Bull. Inst. Pasteur*, xxiv, no. 18, p. 824. Paris, 30th September 1926.)

The species described are *Anopheles* (*Cellia*) *rooti*, sp. n., and *A.* (*C.*) *evansi*, sp. n.

Root (F. M.). **Studies on Brazilian Mosquitoes. I. The Anophelines of the *Nyssorhynchus* Group.**—*Amer. Jl. Hyg.*, vi, no. 5, pp. 684–717, 1 fig., 9 pls., 17 refs. Baltimore, Md., September 1926.

The adults of the *Nyssorhynchus* group of *Anopheles* are so very similar that it is difficult to differentiate the females of closely related species. In this paper constant differences existing in the larval structure and male genitalia have been used for the identification of species, even where no satisfactory characters for the separation of the adult females can be given. It is on these grounds that *Anopheles brasiliensis*, Chagas, is considered to be only a variety of *A.* (*Nyssorhynchus*) *albitarsis*, Lynch. Though the female differs from any other Brazilian species, and is nearer to *A. argyritarsis* than to *A. albitarsis*, the male genitalia and the larva are practically identical with the latter. *A. albitarsis brasiliensis* has probably a wide range in the interior of Brazil, but most of the records from the coastal plain region probably

refer to the typical *A. albitarsis*; the former may be a dangerous malaria carrier, and severe malaria is said to be present where it is abundant. It breeds in large and small pools, ponds, marshes and seepage areas with considerable vegetation.

A key is given to the species of the *Nyssorhynchus* group based on the adult markings, applicable especially to the females, but it is unsatisfactory in some respects. Keys are also given to the species, based on the male genitalia, and to the larvae and pupae so far as known. The author has studied the mature larvae of all the species dealt with except *A. rondoni*, Neiva & Pinto, *A. cuyabensis*, Neiva & Pinto, *A. triannulatus*, Neiva & Pinto, and *A. bachmanni*, Petrochi. The last named is not known in Brazil; it was described from Argentina and is now also recorded from Paraguay; the first three may prove to be different phases of a single variable species.

In discussing the species the author gives the synonymy and general distribution, as well as notes on observations made in Brazil. Until further evidence is available respecting *A. argyritarsis*, the author considers that it is justifiable to use this name for the species that has been known by it for so long in Panama, though it was originally described from Brazil, where it appears to be mainly a highland and interior species, but is also found in and near the foothills in the coastal plain. It is abundant in the plateau region, where there is little if any malaria, and presumably is not a dangerous carrier of the disease. Like all other Brazilian species of the group, it breeds almost invariably in bodies of water that receive the direct rays of the sun at some time during the day. The identity of *A. allopha*, Peryassu, is discussed; it is probably a synonym of *A. argyritarsis*.

A. albitarsis, Lynch, appears to be identical with *A. albimanus* and *A. strodei* in the pupal stage; it has only been found by the author in the coastal plain of the State of Rio de Janeiro. It is probably distributed all along the coastal plain as far as Argentina, and in the southern part of its range it evidently goes farther into the interior; its northern limit has not been determined. It is particularly abundant during the warmer months of the year, epidemiological evidence suggesting that it is a dangerous vector of malaria. The larvae were usually found among vegetation and hardly ever occurred in the bare muddy pools that were often inhabited by *A. tarsimaculatus*. It appears to have a slight preference for large bodies of water.

A. darlingi, sp. n., resembles *A. albitarsis* in adult marking, and has been confused with it. It was only met with in the coastal plain region of the State of Rio de Janeiro, but probably has a much wider distribution. In early May this species and *A. albitarsis* were about equally abundant in dwellings in some localities, whilst in others *A. darlingi* was more abundant than *A. albitarsis* and *A. tarsimaculatus*. No information is available as to its relation to malaria. The larvae occur in mats of surface vegetation in lagoons with hardly any current and in small pools full of vegetation.

A. tarsimaculatus, Goeldi (*gorgasi*, D. & K.) [*cf. R.A.E.*, B, xii, 80] was found in abundance in the coastal lowlands in company with *A. albitarsis* and *A. darlingi*, and also in the foothill region where the latter are largely replaced by *A. argyritarsis*. It was found breeding in the same places as these species and also in pools full of muddy water and almost free from vegetation. Its comparatively frequent occurrence with species of the *Arribalzagia* group suggests that the larvae are more tolerant of shade than the other species of the *Nyssorhynchus* group.

A. albimanus, Wied., was not found by the author in Brazil, and it is suggested that most of the specimens so recorded are aberrant females of *A. tarsimaculatus*.

A. strodei, sp. n., replaces *A. tarsimaculatus* in the plateau and interior regions of Brazil, and apparently also in the interior of Argentina. It was found breeding in company with *A. argyritarsis* in small marshy areas with much vegetation.

Hoffman (W. A.). **Resting Position of Haitian *Anopheles*.**—*Amer. Jl. Trop. Med.*, vi, no. 5, pp. 377–379, 4 figs., 3 refs. Baltimore,Md., September 1926.

The adults of the only two species of *Anopheles* known in Haiti, *A. albimanus*, Wied., and *A. grabhami*, Theo., can readily be distinguished by the differences between their resting positions. *A. albimanus* rests in the manner most usual in Anophelines, with the body making an angle of about 45° with the vertical surface and the posterior legs usually not touching the surface; in *A. grabhami* the body makes almost a right angle with the vertical surface, on which all the legs, which are exceedingly long, rest. Not all species of *Anopheles* rest with the body at an angle to the surface, as *A. culicifacies*, Giles, has been recorded by James & Liston as resting with the body parallel to the surface, as in Culicines, and a similar observation has been made in the case of *A. quadrimaculatus*, Say, by Darling. The apparatus used for photographing Anophelines in their resting positions is described.

Chalam (B. S.). **The Breeding of *Anopheles* in Sea-water and at a Short Distance from the Shore.**—*Ind. Med. Gaz.*, lxi, no. 8, pp. 375–376, 1 ref. Calcutta, August 1926.

Contrary to the general belief that Anophelines do not breed in sea-water, *Anopheles subpictus*, Dön., *A. stephensi*, List., *A. culicifacies*, Giles, and *A. vagus*, Dön., were found doing so in Bombay during anti-malarial work in connection with the Back Bay reclamation scheme. Anopheline larvae were found in water with a saline concentration three times that of sea-water. It has been claimed that sea-water is one of the best larvicides, but this is only true if the larvae have been reared in fresh water.

In connection with the treatment of sea-water breeding-places, a study should be made of the tide, the most likely places being those parts of the foreshore that are washed only by the spring tide, as they would be cut off from tidal action for sufficiently long periods to allow of the development of the mosquitos. Places constantly under tidal influence may be ignored as breeding-places.

Dalal (P. A.) & Madon (E. E.). **Bombay Millponds and Anopheline Control.**—*Ind. Med. Gaz.*, lxi, no. 8, pp. 385–387. Calcutta, August 1926.

Further experiments with Paris green and other materials for the treatment of millponds against Anopheline larvae [*R.A.E.*, B, xiv, 84] are briefly discussed. Paris green was found to be too expensive for regular use, and various mixtures of oils were tried. The best results were obtained with a mixture of 3 parts of residual oil and 2 of kerosene with the addition of 0·1–0·2 per cent. of castor oil It should be applied at the rate of about 1 gal. to 100 sq. ft. of surface.

A simple method of reducing the numbers of *Aëdes* (*Stegomyia*) in houses is described ; it consists of a basin containing water as a trap breeding-place, which is left unchanged until the larvae pupate. The receptacle must be watched, and pupae destroyed before the adults emerge.

YAMADA (S.). **A Revision of the Adult Anopheline Mosquitoes of Japan : Systematic Descriptions, their Habits and their Relations to Human Diseases (Part II).**—*Sci. Repts. Govt. Inst. Infect. Dis. 1925*, iv, pp. 447–493. Tokyo [1926].

This is the conclusion of a paper previously noticed [*R.A.E.*, B, xiv, 13]. A detailed description and notes on the synonymy are given of the following species : *Anopheles* (*Myzomyia*) *minimus*, Theo., *A.* (*M.*) *formosaensis*, Tsuzuki, *A.* (*M.*) *hatorii*, Koidzumi, *A.* (*M.*) *fuliginosus*, Giles, *A.* (*M.*) *hanabusai*, Yamada, *A.* (*M.*) *indiensis* Theo., *A.* (*M.*) *tessellatus*, Theo., and *A.* (*M.*) *kochi*, Dön., and also of *A.* (*M.*) *jeyporiensis*, Theo., var. *candidiensis*, Koidzumi, which was omitted from the tabulated list in the first part of this paper. It is considered by the author that it is not advisable to separate the Formosan form from the Indian species, but to treat *candidiensis* as a variety of *jeyporiensis*. The distribution of these species, their habits and relation to disease are dealt with. In the Japanese Empire they are all confined to Formosa, with the exception of *A. minimus*, which also occurs in the Ryukyu Islands. A key is given to the adult female mosquitos of the Japanese Empire.

In Formosa, *A. minimus* has been recorded as breeding in springs, mountain streams and artificial irrigation ditches. The adults enter houses and are important vectors of malignant tertian malaria. *A. formosaensis* occurs in the coast regions of the south and has also been recorded from Pescadores Island. Although previous experiments have suggested that this species is capable of carrying malaria, this requires confirmation. *A. hatorii* occurs in houses and breeds in streams and pools. *A. fuliginosus* is rare ; the female enters houses and feeds on human blood at night. *A. hanabusai* is common throughout the island. It has been found breeding in mountain springs and artificial irrigation ditches. *A. indiensis* is rare, and *A. tessellatus*, which is distributed all over the island, is not very common. The latter has been found breeding in irrigation ditches. All these species have been experimentally infected with the parasite of malignant tertian malaria by Anazawa. One female of *A. kochi* was found in Formosa in 1903, but no individual has since been recorded, and *A. jeyporiensis* var. *candidiensis* is rare. The relation of the last two species to malaria is unknown.

MOUCHET (R.). **Notes sur la répartition des gîtes à moustiques de Stanleyville.**—*Ann. Soc. belge Méd. trop.*, vi, no. 2, pp. 175–182, 2 maps. Brussels, July 1926.

The author has made a survey of the breeding-places of mosquitos at Stanleyville, a riverside station on the Congo, where, although malaria occurs, mosquitos are not numerous and attract very little attention. The many breeding-places found indicate the necessity of energetic anti-malarial measures. They are of two kinds : natural marshes and other large pieces of water, all of which contain larvae of *Anopheles* and

of *Culex*, and small breeding-places, such as domestic utensils, street gutters, etc., which also contain larvae of both genera. The mosquitos collected from the commoner breeding-places comprise 16 species, and include *Anopheles gambiae*, Giles (*costalis*, Theo.) and *A. marshalli* var. *moucheti*, Evans.

NITZULESCU (V.). **Denticulation des Maxilles de** *Culex pipiens*.—*Ann. scient. Univ. Jassy*, xiii, no. 1–2, pp. 194–198, 2 figs., 5 refs. Jassy, July 1924.

Investigation of numerous *Culex pipiens*, L., has shown that the average number of maxillary teeth is twelve. Remarkable differences exist, however, both as regards the number of teeth and their arrangement and the general formation of the maxilla. Extreme caution is therefore essential in using this organ as a criterion in distinguishing races.

[SEBENTZOV (B. M.).] **Себенцов (Б. М.) Plankton of Turf-pits in connection with the Occurrence of** *Anopheles* **in the latter.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 3, pp. 9–11, 4 refs. Moscow, 1926.

The differences in composition of the types of peat, sphagnum-peat and sedge-peat, in which turf-pits are made, influence the quantity and quality of the composition of the plankton occurring in the waters that they contain, which is here discussed.

Whereas no Anopheline larvae were found in pits in sphagnum-peat, they occurred in those in sedge-peat [see next paper].

[NIKITINSKIĬ (V.).] **Никитинский (В.). Life and Physico-chemical Régime of the Turf-pit and Conditions of Development of** *Anopheles maculipennis* **in it.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 3, pp. 13–15, 6 refs. Moscow, 1926.

Anopheles maculipennis, Mg., occurs in turf-pits in which the water has a pH of 5·64, and its numbers increase with the increase of pH. Under natural conditions the larvae apparently prefer phytoplankton to zooplankton as food. The waters with a pH below 5, such as occur in sphagnum-peat, are very poor in phytoplankton, which is represented by one group, Desmidiaceae, only. It is therefore possible that the physico-chemical factors do not act directly on the distribution of *A. maculipennis*, but indirectly through their effect on the phytoplankton.

[MUFEL' (P. P.).] **Муфель (П. П.). Observations on the Breeding Places of the Malaria Mosquito at Voronezh in 1925.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 3, pp. 17–21, 1 ref. Moscow, 1926.

The flooded areas of the river Voronezh form the main breeding-places of *Anopheles* in that region. The flora found in the various collections of water is discussed; wherever yellowish-green masses were formed larvae were always found, but only isolated individuals, if any at all, were found where a slimy yellow mass predominated. The latter is composed partly of *Oscillaria*, while the former consists mainly of

Spirogyra, *Cladophora*, *Enteromorpha* and *Hydrodictyon reticulatum*. In one of the collections of water a considerable amount of *Chara fragilis* was present, but did not inhibit the development of the larvae.

[Herman (O. A.), Kolosov (Yu. M.) & Lipin (N. M.).] **Герман (О. А.), Колосов (Ю. М.) и Липин (Н. М.). Paris Green as a Means of controlling the Larvae of the Malaria Mosquito.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 3, pp. 35–45, 6 refs. Moscow, 1926.

The contents of this paper have already been noticed from another source [*R.A.E.*, B, xiv, 153].

Index bibliographique des livres et des articles sur la malaria, parus jusqu'a 1914.—*Russ. Jl. Trop. Med.*, 1926, no. 3, pp. 59–65. Moscow, 1926.

This is a transliterated form in French of the first part of a bibliography of the Russian literature on malaria already noticed [*R.A.E.*, B, xiv, 79].

[Yatzenko (F. I.).] **Яценко (Ф. И.). Some Observations on** *Anopheles hyrcanus*, **Pall.** (*pseudopictus*, **Gr.).** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 4, pp. 7–8. Moscow, 1926.

Adults of *Anopheles hyrcanus*, Pall., were found in dwelling houses at the beginning of June in Kherson. At this time they occurred in the proportion of 30 to 70 of *A. maculipennis*, Mg., but in August the proportions were reversed. The adults of *A. hyrcanus* were not found in stables, cattle-sheds or pigsties. Males were only found in the vicinity of the breeding-grounds, which were a mile or more from human habitations. Females were seen entering houses at the second floor. No adults were found in the houses in the winter; their absence and the occurrence of larvae in late autumn suggests that the winter is passed in the larval stage in the Ukraine, where there were three generations during 1925.

[Mirzayantz (A. A.).] **Мирзаянц (А. А.). Malaria and its Control in the Idzhevan Area (according to 3 Years' Experimental Work) and the Discovery of** *Anopheles superpictus*, **Grassi, in that Region.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 4, pp. 9–16, 1 fig. Moscow, 1926.

An account is given of the climatic and topographical conditions in the Idzhevan area (eastern Armenia), with special reference to the incidence of malaria. *Plasmodium praecox* and *P. malariae* both occur, but *P. vivax* is the commonest, accounting for 48·6 per cent. of the total number of cases recorded. *Anopheles maculipennis*, Mg., and *A. superpictus*, Grassi, were caught in almost equal numbers, the former being the more abundant in the summer, and the latter in the winter. The usual methods of draining, filling in, and oiling were adopted according to the area to be treated. The destruction of adult mosquitos in the winter was also undertaken; they were found to be most numerous in stables. It is considered possible that hibernating mosquitos may feed at temperatures as low as 18° C. [64·4° F.].

[Lindtrop (G. T.).] **Линдтроп (Г. Т.). The Distribution of** *Aëdes argenteus*, **Poir. (***Stegomyia fasciata*, **F.) on the Black Sea Coast of the Caucasus.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 4, pp. 17–21, 3 refs. Moscow, 1926.

The general distribution of *Aëdes argenteus*, Poir., along the Black Sea coast of the Caucasus is discussed [*cf. R.A.E.*, B, xiv, 150]. It is much more prevalent than was supposed, and the importance of dealing with it, in view of the danger of the introduction of yellow fever, is pointed out.

[Shingareva (N. I.).] **Шингарэва (Н. И.). Observations and Control of Hibernating Mosquitos in Sanatoria.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 4, pp. 23–25. Moscow, 1926.

In Moscow it appears that *Anopheles maculipennis*, Mg., prefers hibernating quarters having an even temperature, average humidity, not much light and no draughts. The majority were found in cellars and unoccupied rooms. Repeated sudden fluctuations of temperature are inimical to hibernating mosquitos. Of 50 *A. maculipennis* and 50 *Culex pipiens*, L., 98 were killed as a result of lowering the temperature from +18° to −12° C. [64·4° to 10·4° F.] and raising it again six times within half an hour. *A. maculipennis* was found on two occasions hibernating in places with a temperature equal to that out of doors throughout the whole winter. It can withstand temperatures of −30° C. [−22° F.] in hibernation.

The chief remedial measure adopted was fumigation, tobacco dust giving the best results at the lowest price. The burning of 40 gm. per cubic metre killed all mosquitos.

Other Diptera found hibernating in the same places included *Musca domestica*, L., *Muscina stabulans*, Fall., *Calliphora erythrocephala*, Mg., and *Scatophaga* sp. Some Lepidoptera and Coleoptera were also found, the latter including a Staphylinid, *Stenus biguttatus*, L., which preyed on hibernating mosquitos.

[Popov (P. P.).] **Попов (П. П.). Tentative Study of the** *Phlebotomus* **of Russia.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 4, pp. 27–48, 7 figs., 1 ref. Moscow, 1926.

Very little has been done with regard to the study of sandflies in Russia, and the object of the monograph, of which this is the first chapter, is to give a general account of their bionomics, particularly as sandfly fever is known to occur in the Crimea, Caucasus and Turkestan and kala-azar in the Caucasus and Turkestan. In this chapter a key to the families of the Diptera-Nematocera (after Alcock) is given, and the internal and external anatomy of *Phlebotomus* is described.

[Yakimov (V. L.), Saĭkovich (I. V.) & Vasilevskaya (V. I.).] **Якимов (В. Л.), Сайкович (И. В.) и Василевская (В. И.). A New Ixodid in U.S.S.R.** [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 5, pp. 13–16, 8 figs. Moscow, 1926.

The species of the genus *Ixodes* are discussed. *I. birulai*, sp. n., is described from a female taken in eastern European Russia, and its characters are compared with those of *I. ricinus*, L., and *I. signatus*, Birula.

[Yatzenko (F. I.).] **Яценко (Ф. И.). Paris Green as a Larvicide for** *Anopheles maculipennis*. [*In Russian.*]—*Russ. Jl. Trop. Med.*, 1926, no. 5, pp. 71–74. Moscow, 1926.

Experiments carried out in Kharkov for the control of *Anopheles maculipennis*, Mg., by means of Paris green are described. It is considered to be quicker in action than oiling and cheaper, the latter costing 7 or 8 times as much. The poison should be mixed at the rate of 1 part to 40 of road dust or clay, about 100 lb. of the mixture being sufficient for an acre of water surface. The applications should be made at intervals of 18–21 days and repeated six times.

Certain precautions necessary in handling the poison are discussed; there is no reason why its use against mosquito larvae should prove more dangerous to domestic animals than when it is used against locusts, particularly if cattle are kept away from the treated water for three days.

King (W. V.) & Bradley (G. H.). **Airplane Dusting in the Control of Malaria Mosquitoes.**—*Jl. Trop. Med. & Hyg.*, xxix, no. 18, pp. 311–313, 8 figs. London, 15th September 1926.

This information on the application of Paris green by means of aeroplanes for the control of Anopheline larvae has already been noticed from a more detailed account [*R.A.E.*, B, xiv, 125].

Harold (C. H. H.). **Studies on Mosquito Bionomics.**—*Jl. R.A.M.C.*, xlvii, nos. 2 & 3, pp. 81–94, 180–187, 11 refs. London, August & September 1926.

The investigations described are supplemented with notes on the species of mosquitos suitable for laboratory experiments and the methods of breeding them. Observations on the habits of the following mosquitos, with special reference to winter conditions and breeding-places, are given: *Theobaldia annulata*, Schr., *T. morsitans*, Theo., *Anopheles maculipennis*, Mg., *A. bifurcatus*, L., *Culex pipiens*, L., *Aëdes punctor*, Kby., *A. annulipes*, Mg., *A. cinereus*, Mg., *A. geniculatus*, Ol., and *A. rusticus*, Rossi. The blood-meal of naturally fed *A. maculipennis*, *T. annulata* and *C. pipiens* was investigated by the precipitin test [*R.A.E.*, B, xi, 207; xii, 43], but the results obtained were too few to allow the formation of any definite opinion on the food-preferences of these species.

Details of the hydrogen-ion concentration of waters in which larvae of various species of mosquitos have been found in nature are given. *Aëdes maculatus*, Mg., *A. annulipes*, *A. geniculatus* and *A. rusticus* occur in water with a pH of 4·7–4·9; *A. punctor* and *A. cinereus* almost invariably, and *T. morsitans* normally, occur in acid water, although they have been found in water with a pH up to 7·5; *Anopheles bifurcatus*, *A. maculipennis* and *Theobaldia annulata* occur normally in alkaline water, but have been found in water with a pH of 6, 6·8 and 6, respectively; *Culex pipiens* has never been found in acid water, and although when no alkaline water is available females will oviposit in captivity in acid types of water containing natural silt, and the eggs will hatch, the larvae do not grow and die after a time. The dissolved oxygen in typical *A. bifurcatus* and *A. maculipennis* waters amounts only to 0·517–0·876 parts per 100,000, and is still less in times of drought; the carbon dioxide content of the same waters ranges from 0·25 to 1·1 parts per 100,000, and Anopheline larvae have never been found in

waters containing carbon dioxide in excess of 1·8 parts per 100,000 ; the corresponding figures for waters in which larvae of *Aëdes* spp. and *T. morsitans* occur are oxygen 0·814–0·87, and carbon dioxide 3·9–6, per 100,000 parts. Evidence obtained in breeding mosquitos under artificial conditions in the course of several years has led the author to consider that the hydrogen-ion concentration of waters is of minor importance to the developing larvae and that the factor of prime importance is food. Anopheline larvae have gills that are papilliform and more or less rudimentary, they often occur in water containing very small percentages of dissolved oxygen, and they feed mainly at the surface, and it would therefore appear that they may be largely dependent upon food in suspension. Larvae of *Aëdes punctor* and other species, on the other hand, having long retractile gills, are adapted for long periods of submersion, and, in water containing little colloid, etc., in suspension, feed on matter attached to submerged roots and plants. Experiments are described showing that bacteria are more abundant in waters inhabited by *Anopheles bifurcatus* than in those inhabited by *Aëdes punctor*, and that, although larvae of *A. punctor* develop even better when transferred to *A. bifurcatus* water than in their natural water, larvae of *A. bifurcatus* produce weak and small adults when transferred to *A. punctor* water, even with the abnormal pH value of 7·2. From these and other experiments, which were made in the spring, it appears that normally the larva of *A. punctor* develops more rapidly and is capable of developing in the presence of a smaller quantity of bacterial life than that of *A. bifurcatus*, while the latter can subsist for longer than the former without undergoing development, awaiting the advent of more favourable conditions. In late winter larvae of *A. bifurcatus* developed more rapidly in response to the warmth and suitable food of the breeding-room than those of *A. punctor* and *T. morsitans*. It is therefore supposed that mosquito larvae react not only to warmth and food, but also to other latent factors, notably an inherent seasonal influence.

The nature of cresol and its use as a mosquito larvicide are discussed. Saponified cresol is not a suspension of a particular chemical entity, but is a trade name covering fluids of a dissimilar composition that satisfy particular germicidal standards ; in the past ortho-, meta- and para-cresol were undoubtedly components of such fluids, but few of them now contain anything but the merest trace of these, and in their manufacture use is made of the higher di-methyl and tri-methyl phenoloids, which possess higher germicidal power but lower toxicity. Experiments to test the efficiency of proprietary cresols as mosquito larvicides are described ; one preparation, the high germicidal power and low toxicity of which was undoubted, was the least effective larvicide. Larvicidal action was much quicker at 68° F. than at 48° F., and was also increased by the addition of salt to the water treated, and by the presence of acid, although the acidity necessary to increase the effectiveness of the cresol was far in excess of that of most natural acid types of water. The presence of organic silt and placing larvae in non-lethal dilutions before transferring them to lethal ones reduced the larvicidal action of cresol. Culicine larvae are twice as susceptible to cresol as Anopheline larvae, possibly because they spend more time below the surface of the water and rely more upon their gills. Estimation of the larvicidal effect of cresol is often difficult, as the larvae may remain in a moribund condition for 30 hours, apparently dead, and then recover.

Strickland (C.) & Roy (D. N.). **Cresol, Saponified, as a Larvicide.** Stewart (A. D.). **A Note on the Cresols.**—*Jl. R.A.M.C.*, xlvii, no. 3, pp. 188–195, 2 refs. London, September 1926.

In view of the very high toxicity of cresol to mosquito larvae, reported by Mayne [*R.A.E.*, B, viii, 90], experiments were undertaken in India in order, if possible, to confirm his results, which indicated that cresol was a very cheap and effective larvicide. Using cresol of 18/20 Rideal-Walker coefficiency against larvae of *Anopheles subpictus*, Grassi (*rossi*, Giles) the authors obtained results far inferior to those of Mayne (who used cresol of 8/9 R. & W. coefficiency) ; in tap-water about 100 per cent. of the larvae were killed in seven minutes by 1 part cresol in 1,000 parts, in 24 hours by 1 part in 10,000, and in 42 hours by 1 part in 50,000, while 1 part in a million did not kill any larvae in 24 hours ; in polluted river water the toxicity of cresol was, in general, much less. The comparatively low toxicity of the cresol used could not be ascribed to deterioration due to storing in the tropics, as it was equally effective 13 months later. Pupae of *A. subpictus* were much more resistant to cresol than larvae, and at dilutions of 1 part in 10,000 larvae pupated successfully. Culicine larvae were much more susceptible to cresol than Anophelines, and 100 per cent. were killed in five minutes by 1 part in 100,000. In field trials the greatest dilution of any value was 1 part in 50,000, which destroyed all Culicines and many Anophelines in 18 hours, but which would be far too costly for general use. Cresol was more toxic to fish and shrimps than to mosquito larvae. Saponified cresol does not mix quickly with water, so that to obtain speedy results it is necessary to emulsify it with water before applying it, but the emulsion with water rapidly declines in toxicity on standing.

Major Stewart discusses the " phenoloid bodies," which include the cresols, from the chemical aspect. The fractional distillation of coal tar produces various bodies, of which the chief are bases, hydrocarbon oils, which possess little germicidal power, but considerable insecticidal properties, particularly the lighter and more volatile ones, and phenoloid bodies. In general, the lower phenoloids (*e.g.*, phenol) are more toxic to man and have less germicidal power than the higher bodies that distil at a higher temperature, consequently a coal tar disinfectant designed as a potent germicide would consist of a large proportion of the higher phenoloid bodies (particularly cresols) and as small an amount of hydrocarbon oils as possible, an important consideration if it is to be used as a larvicide. It is suggested that the " saponified cresol " used by Strickland & Roy was inferior as a larvicide to that used by Mayne, because the latter, having a lower Rideal-Walker germicidal coefficient and therefore fewer of the higher phenoloid bodies, probably contained more of the lower more volatile neutral hydrocarbon oils. The Rideal-Walker coefficient is therefore not an index of insecticidal power, which may actually be inversely proportional to it. The comparative larvicidal power of the phenoloids has not apparently been determined. The germicidal and probably also larvicidal power of the phenoloids is greatest when they are in fine emulsions ; the emulsifying agents used are either soaps or resins (black disinfectant) or albuminous bodies (white disinfectant). Emulsions of the former type are destroyed by electrolytic agents such as common salt (which may account for the lower toxicity noted in river water), and in both types the droplets tend to coalesce in time when the emulsion is mixed with water, with the result that the germicidal and larvicidal power is diminished.

JAMES (S. P.). **Epidemiological Results of a Laboratory Study of Malaria in England.**—*Trans. R. Soc. Trop. Med. & Hyg.*, xx, no. 3, pp. 143–165. London, 15th September 1926.

The effects of malaria on general paralysis are discussed and experiments recently described [*R.A.E.*, B, xiv, 176] are briefly summarised. In all cases the malarial attacks were induced by the bites of infected *Anopheles maculipennis* instead of by direct blood inoculation. In spite of the large numbers of mosquitos used, it was found difficult to bring many to a condition where they proved successful transmitters of malaria. One reason for this is that only a very small proportion of patients suffering from malaria are infective to *Anopheles*, even when the disease has run its course for a considerable time. A patient in the first attack of benign tertian malaria does not harbour gametocytes of *Plasmodium vivax* until the tenth day of his illness at the earliest. In relapses, however, they may be present on the first day. The number of gametocytes present is a less important factor in infectivity than their quality. Except in unusual circumstances, it is necessary to feed a batch of mosquitos several times upon a malaria case before sporozoites become present in the salivary glands (*i.e.*, before the mosquito is infective). The infection of *A. maculipennis* after one feed on an infective case is quite uncertain, for the zygotes in many cases fail to develop. The most successful infections of *A. maculipennis* with *P. vivax* were obtained at temperatures of 22° and 24° C. (71·6° and 75·2° F.) and in a saturated atmosphere. Mosquitos carrying nearly ripe eggs do not suck nearly so much blood as those with undeveloped ovaries, and little or no blood enters the mid-gut, so that they are not likely to become heavily infected. Again, it is only those mosquitos that feed exclusively on human blood that are likely to become infective, and the feeding on any other food, or on the blood of other animals, tends very largely to prevent development of oöcysts. In every batch of mosquitos there are some that feed heavily, some lightly, and some not at all, and these variations have great influence on natural infection. *A. maculipennis*, when kept under optimum conditions for infection, died at the rate of 50 per cent. per week. In nature, though having only a short adult life in very hot seasons, this mosquito can withstand very low temperatures. The oöcysts of *P. vivax* in the stomach of the mosquito and the sporozoites in the glands are not killed when the insect lives continuously for three weeks at the low temperature of 4° to 5·5° C. (39° to 45° F.), nor during six days with the temperature below freezing-point, nor during intermittently low and high temperatures, though the growth and development of the oöcysts are retarded at low temperatures. Mosquitos used in the present experiments lived and continued to be infective for periods ranging from 29 to 92 days after sporozoites were present in their glands. There is thus no doubt that *P. vivax* can survive even a severe winter in hibernating mosquitos, either in the oöcyst or sporozoite stage, or both.

There seems to be little doubt that individual persons show very varying degrees of susceptibility to malarial infection. Out of 221 persons bitten by infective mosquitos, 52 failed to develop the disease, and it is believed that this failure is due to some unusual chemical or other condition, as yet unknown, in the blood or tissues of certain persons. Physiological and biochemical studies are now required to determine whether there are any simple chemical differences in the blood of people that would account for their varying degrees of susceptibility,

and a test is wanted to enable the classification of people according to their degree of susceptibility.

It seems probable that the special conditions necessary for the infection of mosquitos in the laboratory will also be necessary in nature. Therefore the only mosquitos that become transmitters of malaria are those rare individuals that come to rest in a place favourable to infection, are able to feed several times on an infected person, and have no other food than human blood. Such mosquitos become sluggish after their first feed of blood, and do not leave the house where they obtained it for flights in the open air. Their eggs ripen very slowly, and even when they are ripe, the insects are very loth to make the flight necessary for laying them. Life in the household, with the nightly feed of blood, has become a habit to which everything else is subordinated. At the same time, the importance of these abnormal mosquitos is enhanced because of their great infecting ability. In the experiments some of the mosquitos remained infective for as long as three months, and after biting between 30 and 40 persons still had sporozoites in their glands. This was because the glands were replenished with sporozoites from oöcysts that ruptured at different times.

Work against malaria should therefore largely consist in killing the mosquitos in the dwellings or preventing them from becoming infected there.

In the discussion that followed, it was pointed out that these considerations applied particularly to temperate regions. In the tropics many malaria mosquitos do not infest houses as does *A. maculipennis*, and it is doubtful whether measures against mosquitos in houses would prove so efficacious as they might do in Europe.

K[NOWLES] (R.). **New Conceptions in Malaria.**

SENIOR-WHITE (R.). **Some Ideas engendered by Recent Work on Malaria.**—*Ind. Med. Gaz.*, lxi, no. 9, pp. 451–456 & 456–458. Calcutta, September 1926.

These papers are both discussions of the work noticed above. It is emphasised that this work deals only with infections of *Plasmodium vivax*, with a single vector, *Anopheles maculipennis*, and with what approximate to endemic conditions. It is likely that epidemic conditions, infections with *P. praecox* (*falciparum*), or other vectors might produce different results.

[ST. HILAIRE (C.).] **Сент-Илер (К. К.). Observations on the Malaria Mosquito** (*Anopheles maculipennis*) **near the Town of Voronezh in 1923.** [*In Russian.*]—*Bull. Soc. Naturalistes Voronèje*, i, pt. 1, pp. 17–22. Voronezh, 1925. (With a Summary in German.)

The seasonal history of *Anopheles maculipennis* at Voronezh is discussed. The main breeding-grounds are formed by the river and its tributaries, containing masses of algae [*cf. R.A.E.*, B, xiv, 201]. Comparatively few larvae were found in isolated waters.

During floods, the current removes the algal growths, and the number of larvae at such times is considerably reduced. The possibility of producing the same result artificially by directing the water into one channel is suggested ; this would have to be augmented by filling in the smaller basins, clearing the banks of vegetation and destroying the hibernating mosquitos. The latter are mostly found in cellars.

MARTINI (E.). **Medizinische und veterinärmedizinische Entomologie.** [Medical and Veterinary-medical Entomology.]—*in* Schröder : *Handb. Ent.*, ii, pp. 329–429, 53 figs., 16 pp. refs. Jena, G. Fischer, 1926.

The author divides his subject into four sections : the phenomena of parasitism in vertebrates and their results ; poisons of blood-sucking Arthropods, and the use of insects in medicine ; a list of the most important insect vectors of disease, their susceptible hosts, etc., and the destruction of foci of infection by the control of insects ; and lists of the diseases transmitted by insects.

SHANNON (H. J.). **A Preliminary Report on the Seasonal Migrations of Insects.**—*Jl. N. Y. Ent. Soc.*, xxxiv, no. 2, pp. 199–204, 1 map. Lancaster, Pa., June 1926.

This is a brief account of autumn and spring migrations of insects, particularly as observed by the author along the eastern Atlantic coast of the United States. It suggests that a migratory tendency is widely distributed in the Diptera, involving many individuals and species in annual movements of undetermined extent. Veritable streams of various flies sometimes appear, moving more or less in unison and passing in large numbers during several hours. They occur every year and more than once a year, usually at a certain definite period. Often the flight consists mostly of moderate-sized species, such as *Cochliomyia macellaria*, F., *Phormia regina*, Mg., and others, intermingled with fewer larger flies, such as *Calliphora erythrocephala*, Mg.

FELT (E. P.). [**Report of**] **State Entomologist** [**for 1924**].—*New York State Mus. Bull.*, no. 260, pp. 46–54. Albany, N.Y., June 1925. [Recd. October 1926.]

Some unusual cases of insect infestation are recorded. A living young maggot of a flesh fly, provisionally identified as *Wohlfartia vigil*, Wlk., was removed with several others from the conjunctiva of a man in New York State. The maggots occurred in a small cyst. This appears to be the first American record of adult infestation of the eye, such as is recorded of *W. magnifica*, Schiner, in Europe. There are several records of the fly infesting boil-like sores of the exposed parts of the body, generally of infants, in Canada. A larva of *Attagenus piceus*, Oliv. (black carpet beetle) is recorded as having been vomited by a patient, having been presumably ingested with food, and another was recovered from the vagina of a patient. A larva of *Tineola biselliella*, Hummel (southern clothes moth) was removed from the urethra of a patient. All these latter records are the result of bad sanitation and do not suggest any change of habits on the part of the insects concerned. Houses sheltering numerous bats are frequently infested by *Cimex pilosellus*, Horv. (bat bedbug), which is often mistaken for *C. lectularius*, L., though it is in reality far less obnoxious to man. Both bats and bugs in the walls of dwellings can be destroyed by the use of calcium cyanide.

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Ewing (H. E.). U.S. Bur. Ent. **The Life History and Biology of the Tree-Toad Chigger, *Trombicula hylae* Ewing.**—*Ann. Ent. Soc. Amer.*, xix, no. 3, pp. 261–267, 4 figs., 8 refs. Columbus, Ohio, September 1926.

Trombicula hylae, Ewing, is recorded from California as infesting the tree toad, *Hyla arenicolor*, and it is believed to be the first time that nymphs and adults have been reared from a parasitic mite larva obtained from an amphibian host. Both the former stages are described. The larvae are attached to the toad on the ventral surface, some being merely external parasites while others are partly embedded in the skin. They apparently enter the pores of the mucous glands, and after engorging (which lasts for weeks) are too large to pass out again. In every case dying hosts still harboured several individuals. The nymphs and adults of *T. hylae* live in or on the soil, apparently in a manner similar to that of the common chigger, *T. irritans*, Riley, and also feed on decaying organic matter. The establishment of the fact that these two North American chiggers naturally infest reptiles [*R.A.E.*, B, xiv, 89] and amphibians should indicate the possibility of similar infestation by other species, possibly even disease carriers. A complete study of the possible amphibian and reptilian host-relationships of all the chiggers that infest man is very desirable.

Hoffman (W. A.). **Notes on Ceratopogoninae (Diptera).**—*Proc. Ent. Soc. Wash.*, xxviii, no. 7, pp. 156–159, 4 figs., 4 refs. Washington, D.C., October 1926.

Ceratopogon culicoidithorax, sp. n., described from New York, is the first American species to be placed in this genus. *Culicoides mississippiensis*, sp. n., is described as attacking man in Mississippi.

Pinto (C.). *Phlebotomus neivai* **e** *Phl. fischeri* **n. sp. sp.—Sobre o apparelho espicular dos phlebotomus e seu valor especifico.** [*P. neivai* and *P. fischeri*, spp. n. The Spicule in *Phlebotomus* and its specific Value.]—*Sciencia med.*, iv, no. 7, pp. 370–375, 6 figs. Rio de Janeiro, 31st July 1926.

Two new species, *Phlebotomus neivai* and *P. fischeri*, are described from Brazil.

Pinto (C.). **Classificação dos Triatomideos (Hemipteros-Heteropteros hematophagos).**—*Sciencia med.*, iv, no. 9, pp. 485–490, 2 pls. Rio de Janeiro, 30th September 1926.

The blood-sucking Reduviid genera *Triatoma* and *Rhodnius* are here placed in a new family Triatomidae, with two new subfamilies, Triatominae and Rhodniinae, based on the wing-venation.

Schwenk (J.). **Fauna parasitologica dos blattideos do Brazil.**—*Sciencia med.*, iv, no. 9, pp. 491–504, 20 figs. Rio de Janeiro, 30th September 1926.

This is a preliminary paper. The Nematodes parasitic in the intestinal tract of Blattids in Brazil are discussed, and a number of new ones are described. *Blatticola*, gen. n., is erected for *Oxyuris blatticola*, Galeb., from *Blattella* (*Blatta*) *germanica*, L.

Fischer (H.). **Erfahrungen bei Diametanvergasungen.** [Experiences in Fumigation with Diametan.]—*Zeitschr. Desinfekt.- u. Gesundheitswesen*, 1926, no. 4, reprinted in *Nachrichten über Schädlingsbekämpfung*, i, no. 3, pp. 158–162. Leverkusen, August 1926.

Diametan, which contains sulphur and an oxygen carrier, is intended for the fumigation of rooms infested with insects, etc. Sulphur dioxide is produced when the substance is burned, the sulphur being utilised very fully. To obtain a high concentration of the gas in closed spaces a dull, cold day should be chosen.

Juillet (A.) & Diacono (H.). **Emploi des extraits de *Pyrethrum cinerarifolium* Trev. dans le traitement de la pédiculose du corps (*Pediculus corporis*, de Geer).**—*Bull. Acad. Médecine*, xciv, no. 27, pp. 778–779. Paris, 7th July 1925.

In experiments with extracts of *Chrysanthemum* (*Pyrethrum*) *cinerariaefolium* against *Pediculus humanus*, L. (*corporis*, DeG.) [*R.A.E.*, B, xiv, 107] excellent results were obtained when the proportion of dry pyrethrum extract was as high as 0·25 gm., with the addition of 0·88 gm. ethylene trichloride, to 100 cc. soap solution containing 16 gm. resinous potash soap. The extraction must be made by means of ethylene trichloride, and not by ethyl alcohol, ether, petroleum ether, or carbon tetrachloride. Extraction by percolation in heat yields inactive extracts. The soap must be a soft potash soap, only slightly alkaline, or the activity of the pyrethrum will be destroyed. Soaps containing soda must not be used. At the usual dosages potash soap and ethylene trichloride have no effect except to improve the efficiency of the solution by clearing the chitinous cover of the louse, thus facilitating the penetration of the pyrethrum. All lice and their eggs are destroyed by 20 minutes contact.

v. Jettmar (H. M.). **Beiträge zum Studium der Pest unter den Insekten. I. Mitteilung. Die Tarbaganlaus.** [Contributions to the Study of Plague among Insects. 1st Communication. The Tarbagan Louse.]—*Zeitschr. Hyg. u. Infektionskr.*, civ, no. 4, pp. 551–568, 2 figs., 32 refs. Berlin, 6th June 1925.

This is a detailed report of laboratory observations on the louse, *Linognathoides* sp., infesting the tarbagan, *Arctomys bobac*, in Transbaikalia and Mongolia. This louse sucks blood from man, the marmot, *Spermophilus eversmanni*, and guineapigs, but does not attach itself for any length of time to any host but the tarbagan. On the death of its host it transfers to another. Ingested plague bacilli rapidly multiply in the louse, which dies 2–3 days after feeding. Healthy lice, placed in test-tubes with some rodent hairs (as the lice soon die for lack of such support to cling to) can live without food at room temperature for 10 days or even more. Virulent bacilli are found in the gut only, and the excreta of infected lice consist almost exclusively of them. Lice removed from infected marmots after the death of their hosts and kept at room temperature in Petri dishes nearly all died within two days. Their bodies, exposed to light and air, remained infective for more than 13 days after removal from the marmots; guineapigs into which extracts from the bodies were injected died of plague. Lice that have

died of plague are dark red in colour. The smearing of the mouth-parts of the lice with a virulent plague culture did not render them infected.

HIRST (L. F.). **Plague Fleas, with special Reference to the Milroy Lectures, 1924.**—*Jl. Hyg.*, xxiv, no. 1, pp. 1–16, 15 refs. Cambridge, July 1925.

This is a discussion of the importance of *Xenopsylla cheopis* and the relative unimportance of *X. astia* in the transmission of plague, with particular reference to Ceylon [*cf. R.A.E.*, B, xiii, 193].

YAMASAKI (Shigeru). **Ueber** *Leptomonas ctenocephali, Trypanosoma lewisi* **und pathogene Trypanosomenarten im Hundefloh.** [On *Herpetomonas ctenocephali, T. lewisi* and pathogenic Trypanosomes in the Dog Flea.]—*Arch. Protistenk.*, xlviii, pp. 136–179, 5 figs. 1 pl., 1924. (Abstract in *Centralbl. Bakt. Paras. Infekt.*, II. Abt. lxviii, no. 15–25, pp. 487–488. Jena, 8th October 1926.)

The following are among the results recorded : Morphological investigation of *Herpetomonas* (*Leptomonas*) *ctenocephali* in *Ctenocephalus canis* and in cultures, and a comparison of it with cultural flagellate forms of *Leishmania donovani* show that the two are clearly distinguishable, and that the supposed developmental stages of *Leishmania* described by Basile from the dog-flea [*R.A.E.*, B, ix, 54] are really *H. ctenocephali*. Attempts to transmit this flagellate to mice and young dogs by inoculation failed.

In the case of *Trypanosoma lewisi* the occurrence of free divisional forms soon after ingestion by the flea proves that an intracellular increase in the stomach wall is not a preliminary condition for a further development in the flea. All, or nearly all, fleas that have fed on the blood of rats containing *T. lewisi* acquire infection. The transmission of *T. lewisi* to the rat can result from feeding by the flea, and this manner of transmission is almost as important as that due to the ingestion of flea excreta. *T. lewisi* was regularly found in the stomach and sometimes in the proventriculus of the flea, and the flagellates presumably reach the wound caused by the bite from there. The disease was not produced in mice by ingestion of flea excreta, nor in monkeys by their subcutaneous inoculation.

The pathogenic trypanosomes, *Trypanosoma* (*Schizotrypanum*) *cruzi, T. brucei, T. equinum, T. equiperdum* and *T. evansi*, do not develop in fleas. *T. cruzi* perishes within ¾ hour in the intestine of the flea, *T. brucei* in 1½ hours, *T. equinum* in 3 hours, *T. evansi* in 4 hours, and *T. equiperdum* in 5 hours. It is on the duration of life in the flea that the chances for a mechanical transmission of these trypanosomes from one mammal to another may be supposed to depend.

OUDEMANS (A. C.). **Kritisch historisch Averzicht der Acarologie. Eerste Gedeelte 850 v. Chr. tot 1758.** [A critical, historical Survey of Acarology. Part One—850 B.C. to A.D. 1758.]—*Tijdschr. Ent.*, lxix, Suppmt., 500 pp., 70 figs., 48 pp. refs. The Hague, October 1926.

The title of this work indicates its character.

Warburton (C.). **Fauna simalurensis. Ixodidae.**—*Treubia*, viii, no. 3–4, p. 279. Buitenzorg, July 1926. [Recd. November 1926.]

The ticks, *Aponomma trimaculatum*, Luc., *Amblyomma helvolum*, Koch, *Haemaphysalis leachi*, Aud., *H. hystricis*, Sup., and *Dermacentor auratus*, Sup., are recorded on various animals from islands off the west coast of Sumatra.

Warburton (C.). **Ixodidae from Sumatra.**—*Treubia*, viii, no. 3–4, p. 280. Buitenzorg, July 1926. [Recd. November 1926.]

The ticks recorded, with their hosts where known, include *Haemaphysalis leachi*, Aud., *H. hystricis*, Sup., *Amblyomma testudinarum*, Koch, *Ixodes spinicoxalis*, Neum., *I. granulatus*, Sup., and *Dermacentor auratus*, Sup.

Cowdry (E. V.). **A Group of Microorganisms transmitted hereditarily in Ticks and apparently unassociated with Disease.**—*Jl. Exptl. Med.*, xli, no. 6, pp. 817–830, 3 pls., 5 refs. New York, 1st June 1925.

Intracellular microorganisms that stained much less intensely with ordinary dyes than most bacteria were found in 16 species of ticks, including both Ixodids and Argasids. They seem to be transmitted hereditarily.

Cowdry (E. V.). **Studies on the Etiology of Heartwater. *Rickettsia ruminantium* (n. sp.) in the Tissues of infected Animals and of Ticks transmitting the Disease.**—*Jl. Exptl. Med*, xlii, no. 2, pp. 231–274, 2 pls. New York, August 1925.

The *Rickettsia* associated with heartwater of domestic animals in South Africa [*R.A.E.*, B, xiii, 72] is here described as *R. ruminantium*, sp. n. It was not found in any species of tick other than *Amblyomma hebraeum*, Koch.

Brassler (K.). **Statistik der Dasselfliegenplage.** [Statistics on the Warble Fly Pest.]—*Neue Pelzwarenztg. Kürschnerztg.*, 1926, p. 638. (Abstract in *Anz. Schädlingsk.*, ii, no. 10, pp. 141–142. Berlin, 15th October 1926.)

Official figures show that 40·7 per cent. of the hides of cattle in Germany are injured by warble-flies [*Hypoderma*].

Imes (M.). **Summary of Results of Field Trials by the U.S. Bureau of Animal Industry on Ox-warble Control.**—*Jl. Parasitology*, xiii, no. 1, pp. 42–46, 1 ref. Urbana, Ill., September 1926.

The following is taken from the author's conclusions: Arsenical dips are not a satisfactory remedy for the control or eradication of ox-warble flies [*Hypoderma*]. Repeated dipping in any of the known cattle dips reduces infestation, but does not eradicate the fly. Treatment of cattle during the fly season in wading vats charged with a 2 per cent. solution of coal-tar creosote dip or processed crude petroleum, or similar oils, prevents heavy infestation, but does not effect complete eradication; it is, however, practical and economical for use on farms.

HADWEN (S.). **Notes on the Life History of** *Oedemagena tarandi*, **L., and** *Cephenomyia trompe*, **Modeer.**— *Jl. Parasitology*, xiii, no. 1, pp. 56–65, 2 figs., 5 refs. Urbana, Ill., September 1926.

Notes are given on the bionomics of *Oedemagena tarandi*, L., and *Cephenomyia trompe*, L., infesting reindeer, as observed in Alaska [*cf. R.A.E.*, B, x, 40]. *O. tarandi* oviposits mainly on the parts of the reindeer that come in contact with the soil when the animal is lying down, while on standing animals it lays eggs mostly in the region of the stifle joint behind, and the elbow in front. The growth of the larvae in the host is discussed. They bore through the skin and travel up the muscle sheaths to the back, this being a definite migration and taking several weeks.

Under experimental conditions the eggs hatched in 6–7 days. The adults are on the wing from the end of June to the beginning of September. The first mature larvae escaping from the back were found on 12th May, and by 1st July most of them had left the body. As a rule the larvae grow at a regular rate throughout the year, though in some cases growth is arrested, which suggests that certain portions of the sub-cutis of the reindeer possess the power of inhibiting the growth of larvae without actually killing them. This is probably because the place chosen by these larvae had been occupied by others in the previous year, and the tissues had therefore developed a greater power of resistance than is found in parts of the body not previously infested. As the animals grow older, a certain immunity develops, which, however, disappears again in old age.

After most of the larvae have left the reindeer, towards the end of June, the animals should be driven as far away as possible from the place where the larvae have fallen, so that the emerging flies will not be able to find the herd and will die. In Lapland the percentage of infestation is much lower than in Alaska owing to the nomadic life of the Laps.

In the case of *C. trompe* the larvae are dormant during the first eight months, development beginning as the weather gets warmer ; the first larvae were seen to emerge from the nostrils on 12th May. The pupal stage lasted as long as 56 days in Alaska, but this was under adverse conditions, and only 20 flies emerged from 54 pupae. Constant movement of the herds should reduce the number of flies, but the best method of preventing attack is to provide darkened shelters for the animals.

BISHOPP (F. C.) & WOOD (H. P.). **Mites and Lice on Poultry.**— *U.S. Dept. Agric.*, Farmers' Bull. 801, revised, 28 pp., 15 figs., 3 refs. Washington, D.C., April 1924.

Previous editions of this bulletin have already been noticed [*R.A.E.*, B, vi, 14 ; viii, 84]. The feather mite, *Liponyssus sylviarum*, C. & F., which differs from the common chicken mite (*Dermanyssus gallinae*, DeG.) in that it may complete its life-cycle without leaving its host, may be eradicated by dipping the fowls in a solution of 2 oz. flowers of sulphur and 1 oz. soap in 1 U.S. gal. water. The feathers should be thoroughly wet to the skin and the head submerged for an instant, the mixture being stirred during the process to keep the sulphur in suspension. If treatment is necessary in winter or early spring, the mites may be destroyed by dusting with flowers of sulphur. The nesting material should be burned, and the nest boxes, roosts, walls and floors of the chicken houses painted with carbolineum. The nests of English sparrows, which harbour the mite, should also be burned.

After fowls have been dusted with sodium fluoride to destroy lice, they should be released in the open to prevent possible injury to them from breathing the dust, which might occur if they were crowded in a building. A hen should be treated before the eggs hatch, as sodium fluoride, if used too freely on very young chicks, may kill them ; in any case they should not be treated until they are about a week old.

CORRADO (E.). **Contributo alla geografia medica della Somalia Italiana.** [The Medical Geography of Italian Somaliland.]—*Pathologica*, xvii, no. 402, pp. 438–441. Genoa, 15th August 1925.

The observations recorded in this paper were made from September 1924 to April 1925. Malaria is the chief disease, and *Anopheles maculipennis* the predominant Anopheline. Culicines include *Aëdes argenteus* (*Stegomyia fasciata*), which was particularly abundant, *Theobaldia* spp., and *Culex pipiens*. The mosquitos increase enormously during the rainy season, as does the malarial incidence. *Plasmodium vivax* was more common than *P. praecox* (*falciparum*) ; quartan malaria was not observed.

Glossina pallidipes occurs in considerable numbers, especially along the Juba, and is the carrier of trypanosomiasis, usually fatal, in camels, bovines and equines. No cases of sleeping sickness have been recorded. Relapsing fever, caused by *Spirochaeta duttoni*, occurs, and the ticks, *Ornithodorus moubata* and *O. savignyi*, are common. Dengue attacks Europeans on the coast, *Aëdes* (*Stegomyia*) spp. and *Culex* spp., including *C. fatigans*, being numerous.

[PARFENT'EV (I. A.).] **Парфентьев (И. А.). On the Question of Controlling Mosquito Larvae.** [*In Russian.*]—*Défense des Plantes*, iii, no. 2–3, pp. 274–276, 1 ref. Leningrad, July 1926.

Preliminary experiments with Paris green and sodium arsenite dusted on the water surface for the control of mosquito larvae have given results that warrant further investigation. Either material applied at the rate of 2–3 gm. to the square metre of water surface destroyed the larvae. Paris green remains on the water surface as a fine dust and is insoluble. Sodium arsenite should be finely ground or it will sink to the bottom of the water. Though it is soluble in water, it remains long enough in suspension to kill the larvae, and applied at the above strength in water having a depth of 2 in. or more it may remain harmless to other life in the water, as the concentration in solution would be very weak. As, however, it scorches any plants with which it comes in contact above the water, it is suggested that insoluble arsenicals, such as calcium arsenate, should be tried.

Recent experiments carried out in the United States are reviewed [*R.A.E.*, B, xiv, 125].

[SHCHELKANOVTZEV (Ya. P.).] **Щелкановцев (Я. П.). A Contribution to the Knowledge of the Mosquito Fauna of South-Eastern R.S.F.S.R.** [*In Russian.*]—*Bull. Soc. Naturalistes Voronèje*, i, pt. 2–4, pp. 123–133, 8 figs. Voronezh, 1926.

The mosquitos collected in the vicinity of Azov, Rostov-on-Don and Voronezh are *Anopheles bifurcatus*, L., *A. maculipennis*, Mg., *A. plumbeus*, Steph., *Aëdes cinereus*, Mg., *A. annulipes*, Mg., *A. dorsalis*, Mg.,

A. vexans, Mg., *Culex pipiens*, L., *C. territans*, Wlk., and *C. tanajcus*, sp. n., which is closely allied to, and may be identical with, *C. bicolor*, Mg. *A. cinereus* and *C. territans* are apparently recorded for the first time from Russia.

HURTER (E.). **Die Stechmückenplage in Mitteleuropa und ihre Bekämpfung.** [The Mosquito Pest in Central Europe and its Control.]—*Schweiz. Zeitschr. Gesundheitspflege*, vi, nos. 1–3, reprint, 140 pp., 8 figs., 3 pls., 54 refs. [Zurich] 1926.

This work is designed to give non-scientific readers a clear and comprehensive knowledge of mosquitos, their morphology, biology and control.

FALLERONI (D.). **Note sulla biologia dell'** *Anopheles maculipennis*. —*Riv. Malariologia*, v (N.S. i), no. 4, pp. 353–380, 14 refs. Rome, July-August 1926. (With Summaries in French and English, pp. 549 & 551.) [Recd. October 1926.]

In the Pontine Marshes *Anopheles maculipennis* is able to breed in winter, and also to feed and transmit malaria, oocysts and sporozoites having been observed in several individuals in January and February. It has been found that when this mosquito sucks the blood of living animals or fluids through a membrane, the liquid passes direct to the stomach, whereas, when it feeds on free liquids, they are only drawn into the oesophageal diverticula. These observations, which are discussed in detail, appear to exclude the possibility of direct transmission of malaria by the mosquito.

LA FACE (L.). **Revisione degli Anofelini italiani. Nota II[a]. Osservazioni sugli Anofelini del Ferrarese.** [Revision of the Italian Anophelines. II. Observations on the Anophelines in the Ferrara Region.]—*Riv. Malariologia*, v (N.S. i), no. 4, pp. 381–391, 7 refs. Rome, July–August 1926. (With Summaries in French and English, pp. 549 & 551.) [Recd. October 1926.]

As a result of observations made around Ferrara the specific identity of *Anopheles elutus* as distinct from *A. maculipennis* (*claviger*) has been established. In malarious districts there is a distinct prevalence, at least in summer, of *A. elutus*, whilst in districts where malaria is almost absent *A. maculipennis* predominates. Attention is drawn to the large numbers of *A. elutus* found in dwellings during these investigations.

GIOSEFFI (M.). **Le "Gambusie" nella lotta antimalarica in Istria.** [*Gambusia affinis* in antimalarial Work in Istria.]—*Riv. Malariologia*, v (N.S. i), no. 4, pp. 469–475, 7 refs. Rome, July–August 1926. (With Summaries in French and English, pp. 550 & 552.) [Recd. October 1926.]

Experience has shown that *Gambusia affinis* is effective for combating Anopheline larvae in Istria. This fish has easily become acclimatised there, and has survived the hot summers and winter frosts of 1925–1926. It has practically caused the disappearance of larvae in collections of water, and has reduced the endemic malaria.

Hanson (H.) & Dunn (L. H.). **The Use of Fish in the Control of Yellow Fever in Peru.**—*Milit. Surgeon*, lvii, no. 3, pp. 232–241. Washington, D.C., September 1925.

Experiments made in Peru in 1921 and 1922 with fish against the yellow fever mosquito, *Aëdes argenteus* (*aegypti*), are described. A local species, *Pygidium piurae*, feeds voraciously on the larvae and pupae. It survives crowding in the pails and cans used for transport purposes and rapidly adapts itself to life in containers. More than 80 per cent. of some 857,000 fish distributed belonged to this species.

Edwards (F. W.). **Mosquito Notes.—vi.**—*Bull. Ent. Res.*, xvii, pt. 2, pp. 101–131, 11 figs. London, October 1926.

Aëdes variegatus, Dol., is widely distributed in the Australasian region, and recent examination has shown that there are at least five distinct varieties. Their characters, though fairly well defined, are best treated as varietal rather than specific, especially as their significance appears to be mainly geographical. These varieties are described and include the three new ones, *A. variegatus* var. *hebrideus* from the New Hebrides ; *A. variegatus* var. *tongae* from Tonga Island and the Solomon Islands, where it was reared from larvae in coconut shells ; and *A. variegatus* var. *andrewsi* from Christmas Island.

The species of the *kochi* group of the subgenus *Finlaya* here dealt with are *A. kochi* var. *poicilia*, Theo., from the Philippine Islands, Borneo, Sumatra and Malay Peninsula ; *A. kochi*, Dön. (type form) from various islands in the Pacific ; *A. kochi* var. *samoana*, Grünb., from Samoa and Tonga ; *A. wallacei*, sp. n., from New Ireland ; and *A. flavipennis*, Giles (*lutea*, Ludl., *aranetana*, Banks) from the Philippines and Singapore. A key is given to these.

The following are also described : *Culex* (? *Culiciomyia*) *atriceps*, sp. n., from Tahiti ; *C.* (*Lophoceratomyia*) *hilli* var. *buxtoni*, n., from the New Hebrides ; *C. femineus*, sp. n., from the New Hebrides ; *C. bihamatus*, sp. n., from Timor ; and *C. trifidus*, sp. n., from the lesser Sunda Islands.

Additional records from the Solomon Islands [*R.A.E.*, B, xiii, 47] bring the total number of mosquitos known from the islands up to 22. The ten species here recorded include *A.* (*Stegomyia*) *edwardsi*, Barr., var. *tulagiensis*, n., from Santa Cruz Island. Notes are given on a number of mosquitos from Tasmania and South-East Australia, including *Theobaldia hilli*, sp. n., from Victoria ; *T. weindorferi*, sp. n., from Tasmania ; *Aëdes* (*Ochlerotatus*) *andersoni*, n. n., for *Andersonia tasmaniensis*, Strickland, from Tasmania and Victoria, previously thought to be identical with *Aëdes nigrithorax*, Macq. ; *A.* (*O.*) *nivalis*, n. n., for *Culex australis*, Theo. nec Erichson, from Tasmania ; *A.* (*O.*) *luteifemur*, sp. n., from Tasmania and Victoria ; and *A.* (*O.*) *purpuriventris*, sp. n., from Tasmania, which may possibly be the female of *A. nigrithorax*.

The larvae of the following species are described from Singapore : *Megarhinus acaudatus*, Leic., occurring singly in pitcher-plants ; *Uranotaenia brevirostris*, Edw. ; *U. subnormalis*, Mart. (*roperi*, Edw.) ; *Rachionotomyia aranoides*, Theo., the commonest pitcher-plant mosquito in Singapore, the larva having been previously described by de Meijere under the name of *Ficalbia tenax* ; *R. nepenthis*, Edw.; *Orthopodomyia maculipes*, Theo., obtained in a tree-hole ; *Armigeres giveni*, sp. n., reared from larvae found in pitcher-plants ; *Aëdes amesi*, Ludl.

(*Stegomyia fusca*, Leic.), found in water collected in the hollows of a fallen tree in a mangrove area; *A. longirostris*, Leic., from a mangrove area; *Culex spathifurca*, Edw., reared on two occasions from larvae found in pots of pure urine placed as traps; *C. nigropunctatus*, n. n., for *Culiciomyia annulata*, Theo. (*Culex pullus*, Edw. nec *C. pullus*, Theo., of which *C. muticus*, Edw., is considered a synonym); and *C.* (*Lophoceratomyia*) *navalis*, sp. n., reared from pitcher-plants. The larva of *C. minor*, Leic., from bamboo in the Malay Peninsula is also described.

Notes are given on the following species from the Belgian Congo: *Anopheles implexus*, Theo., the stages of which are described, found breeding in a small clear stream running through a forest glade, *A. kingi*, Chr., *A. distinctus*, N. & C., *A. wellcomei*, Theo., *A. theileri*, Edw., *A. maculipalpis*, Giles, *Uranotaenia inornata*, Theo., *Aëdes* (*Stegomyia*) *schwetzi*, sp. n., *Taeniorhynchus* (*Coquillettidia*) *nigrithorax*, Theo., *T.* (*C.*) *fuscopennatus*, Theo., var., and *Culex kingianus*, Edw.

A list is given of the Culicine fauna of Nairobi with notes on the following species: *Aëdes* (*Stegomyia*) *deboeri*, sp. n.; *A.* (*Aëdimorphus*) *lamborni*, Edw., of which the larva is described; *A.* (*Ochlerotatus*) *caspius*, Pall., a single specimen of which was received, though if it really came from Nairobi its occurrence is difficult to explain; *Culex consimilis*, Newst.; *C. vansomereni*, sp. n., *C. trifilatus*, Edw.; *C. pallidocephalus*, Theo.; *C. mirificus*, Edw.; *C. pipiens*, L.; and *C. fatigans*, Wied.

HOFFMAN (W. A.). **Two New Species of American** *Leptoconops* **(Diptera, Chironomidae).**—*Bull. Ent. Res.*, xvii, pt. 2, pp. 133–136, 1 fig. London, October 1926.

Leptoconops (*Leptoconops*) *carteri*, sp. n., described from California, and *L.* (*Holoconops*) *hondurensis*, sp. n., from Honduras, cause considerable annoyance by attacking man. A specimen from Cuba agrees with *L. hondurensis* and possesses an identical thoracic sensory organ. Should this character be relatively constant, it will prove to be of considerable value in differentiating dry mounted specimens.

MONTCHADSKY (H. S.). **Larva of** *Aëdes* (*Ochlerotatus*) *pulchritarsis*, **Rond., var.** *stegomyina*, **Stack. & Montch., nov., from Turkestan.**—*Bull. Ent. Res.*, xvii, pt. 2, pp. 151–157, 5 figs. London, October 1926.

The adult and larva of *Aëdes* (*Ochlerotatus*) *pulchritarsis* var. *stegomyina*, n., are described, the description of the adult being quoted from a manuscript by Stackelberg. The larvae of *A. pulchritarsis* breed exclusively in tree-holes that are periodically flooded when the water is released from irrigated fields, and are therefore only to be found in restricted localities where topographical conditions and irrigation permit their existence. Though previously common, this mosquito no longer occurs in Old Bokhara, owing to drainage and improved irrigation methods. The winter is passed in the egg stage. The number of generations, not less than three, depends on the periodical flooding of the tree-hollows, which may dry out completely in the summer, the eggs being able to resist this desiccation. The larvae are very resistant to

unfavourable environment, some third stage larvae received corked in narrow glass tubes completed their development in them with only a delay of about three weeks.

Notes are given comparing this species with other closely related mosquitos.

Dunn (L. H.). **Mosquitos bred from Dry Material taken from Holes in Trees.**—*Bull. Ent. Res.*, xvii, pt. 2, pp. 183–187. London, October 1926.

These observations on the breeding habits of *Aëdes argenteus*, Poir. (*aegypti*, L.) in Nigeria were made with a view to ascertaining if the selection of breeding-places by this mosquito in Africa differs from that in the Western Hemisphere. A survey was made of the rot-holes and fork hollows in trees in the vicinity of Lagos shortly after the rainy season had passed and the dry season had set in. Samples of material were obtained from 100 trees, with a total of 114 holes. As they mostly consisted of dry leaves and débris, no larvae were found. When the material was placed in containers in the laboratory and moistened, larvae were obtained from 40 samples taken from 38 trees.

The following species were bred: *A. luteocephalus*, Newst., *A. wellmani*, Theo., *A. africanus*, Theo., *A. apicoannulatus*, Edw., *A. apicoargenteus*, Theo., *A. argenteus*, Poir., *A. simpsoni*, Theo., and *A. longipalpis*, Grünb. It is evident that the eggs of these species are resistant to the lack of water in the dry season and remain viable until the beginning of the rains. Nothing definite was noted to indicate that the different species prefer certain varieties of trees for oviposition. *A. argenteus* occurred in three samples, two of which were located in compounds not more than 10 yards from houses occupied by natives. The fauna of the various holes included lizards, centipedes, etc., and various insects, ants being found in 85 per cent. of the holes. It is probable that a large number of the mosquito eggs are destroyed by them.

Taylor (F. H.). **Notes on Australian Tabanidae (Diptera).**—*Bull. Ent. Res.*, xvii, pt. 2, pp. 193–195. London, October 1926.

Notes are given on the nomenclature of a number of Australian Tabanids as a result of correspondence with Major E. E. Austen. The species dealt with include: *Tabanus oculatus*, Ric. (*kendallensis*, Tayl.), *T. constans*, Wlk. (*minor*, Tayl. nec Macq.), *T. neogermanicus*, Ric. (*hilli*, Tayl.), *T. queenslandi*, Ric. (*walteri*, Tayl.), *T. innotabilis*, Wlk. (*kurandae*, Tayl.), *T. brisbanensis*, Tayl., which is not a synonym of *T. regis-georgii*, Macq., and *Udenocera* (*Acanthocera*) *australis*, Ric.

Smales (W. C.). **Annual Report on the Health of Gibraltar for the Year 1925.**—ix+79 pp., & appx., 35 pp. (Reviewed in *Brit. Med. Jl.*, no. 3430, pp. 609–610. London, 2nd October 1926.)

The chief feature of this report is the appendix containing an account of a mosquito campaign undertaken during the summer of 1925. The common mosquito in the colony is *Aëdes argenteus* (*Stegomyia fasciata*), and there are no Anophelines. Until the underground rainwater tanks, of which there are large numbers connected with the houses in Gibraltar, are abolished completely, it is not expected that mosquitos will entirely disappear.

[Yablokov (N. A.).] **Яблоков (Н. А.). Little-known Enemies of *Anopheles* Larvae.** [*In Russian.*]—*Russ. hydrob. Zs.*, v, no. 7–9, pp. 194–195, 4 refs. Saratov, July–September 1926.

It was noticed that larvae of *Anopheles maculipennis*, Mg., in an aquarium were very extensively preyed upon by *Hydra fusca*, L., and leeches (*Clepsine* sp.). One *Hydra* devoured in a fortnight as many as 30 larvae of *A. maculipennis* and six of *Culex pipiens*, L. Larvae up to the fourth stage are subject to the attacks of *Hydra*. Leeches are also important factors in the natural control of mosquito larvae.

Martini (E.). **Culiciden des mittleren Wolgagebiets.** [Mosquitos of the Central Volga District.]—*Bull. Acad. Sci. U.R.S.S.*, ser. vi, no. 9, pp. 607–618. Leningrad, 1926. (With a Summary in Russian.)

The bulk of the information contained in this paper has been already noticed [*R.A.E.*, B, xiv, 112].

Wesenberg-Lund (C.). **Om Myg og Myggeplage.** [On Mosquitos and Mosquito Plague.]—62 pp., 11 figs. Copenhagen, J. H. Schultz, 1925.

This is a popular account of Danish mosquitos and their control. *Culex pipiens* is very common, but of no importance to man, though it is found in fowl houses. *Theobaldia* (*C.*) *annulata* hibernates in cellars and is frequently brought into houses with fuel. Both species have increased in recent years, partly because sewers from country houses empty themselves into bogs, and the increasing industrialism of the country results in a greater contamination of fresh waters. *Aëdes* (*C.*) *communis* is the most prevalent mosquito in early summer and *A.* (*C.*) *maculatus* (*cantans*) later on.

The Anophelines do not attack man, and there is therefore no danger of the reappearance of malaria in Denmark.

Gemayel (Amin). **La Malaria en Syrie, autrefois—aujourd'hui.**—*Presse médicale*, xxxiv, no. 14, pp. 219–220. Paris, 17th February 1926.

In support of the view that malaria has been known in Syria and Palestine from the earliest times passages are quoted from various sources beginning with Deuteronomy, xxviii, 22. It is stated that in 1884 an Arab author published a paper expressing the view that mosquitos were undoubtedly concerned in the transmission of the disease.

Maire (G. L. E.) & Sabbagh (A.). **Le paludisme dans la région de Damas.**—*Arch. Méd. & Pharm. milit.*, lxxxiv, no. 3, pp. 253–291, 3 maps, 17 refs. Paris, March 1926.

In the neighbourhood of Damascus *Anopheles maculipennis*, Meig., is the most abundant Anopheline, but others probably exist.

Bose (K.). **An Extract from a Report on Mosquito Control at Birnagar.** —*Calcutta Med. Jl.*, xx, no. 5, pp. 202–209. Calcutta, November 1925.

In the course of this antimalarial work the Anophelines found included *Anopheles subpictus* (*rossi*), *A. culicifacies*, *A. saxicola* (*fluviatilis*), *A. jamesi*, *A. barbirostris* and *A. hyrcanus* var. *nigerrimus*. Mosquitos were found to breed in enormous numbers in tree-holes and in the hollows of bamboo stumps, and more than 1,600 trees covering an area of about 1½ square miles were treated. In most cases the lower bark was cut off so as to allow the water to run out ; in others the cavities were filled up with rubbish. Great difficulty was experienced in keeping down the water-weeds in tanks, as they reappeared rapidly, those containing *Pistia stratiotes* had to be cleared every 10–14 days. Crude oil was almost wholly used for treating the deep pools, and the addition of castor-oil was not found to increase the duration of the film. Cresol was found effective where vegetation occurs, but it was difficult to apply. Its larvicidal effect lasted for 36 hours. Tanks fully stocked with small fish, such as *Chela punctio* and *Anabas scandens*, did not show any marked diminution of larvae.

There was no breeding of Anophelines in the winter of 1923–24 and in the hot season of 1924, owing probably to extremely dry weather. Hibernation was so complete that Anopheline larvae were not found in any tank before 30th June, and no adults could be caught before July.

In 1924–25, hibernation was only partial, and mosquitos bred freely in winter in all tanks that were not cleared. The abnormal rise in malaria cases in July 1925 was due to swarms that bred uninterruptedly in tanks during the winter and the hot season, and the oiling of pools, though begun as early as May, could have no effect on the brood that had already emerged. It therefore appears that if mosquitos do not breed between January and May, there will be no increase in malaria during the epidemic period, July to November. If, however, the mosquitos do not hibernate, or do so only partially, a severe epidemic may be predicted.

Jackson (L. E.). **Mosquito Control in New Jersey during the Breeding Season of 1924.**—*Amer. Jl. Pub. Health*, xv, no. 2, pp. 131–133, 3 figs. Albany, N.Y., February 1925.

In New Jersey, there are now more than 5,000 miles of drainage ditches, of an average width of 10 inches, the standard adopted in the State. One outstanding feature in the advance in work against salt-marsh mosquitos lies in the use of machinery, and a full description is given of a ditch-cleaning machine just perfected. With this apparatus, the cost per linear yard is about ½d., including overhead and depreciation charges. A ditch cutting machine, digging by means of collapsible metal buckets, is also being designed, with which it is estimated that the cost of ditching will be about ¼d. per linear foot.

Pessoa (S. B.) & Prado (A.). **Ligeiras notas sobre a malaria em S. Vicente.** [Brief Notes on Malaria at S. Vicente, Brazil.]—*Ann. Paulistas Med. e Cirurg.*, xvi (Year 13), no. 11, pp. 142–148, 5 figs. S. Paulo, November 1925.

Malaria is endemic in S. Vicente and has increased considerably since the end of 1921. The mosquitos observed were the Anophelines,

Anopheles (*Cellia*) *argyritarsis*, R.D., *A.* (*C.*) *allopha*, Lutz & Peryassú, *A.* (*C.*) *tarsimaculatus*, Goeldi, and *A.* (*Arribalzagia*) *pseudomaculipes*, Chagas; and the Culicines, *Megarhinus separatus*, Lynch, *Aëdes argenteus*, Poir. (*aegypti*, L.), *A.* (*Culex*) *crinifer*, Theo., *A.* (*C.*) *scapularis*, Rond. (*confirmatus*, Lynch), *C. fatigans*, Wied. (*quinquefasciatus*, Say), *Psorophora discrucians*, D. & K., and *Taeniorhynchus* (*Mansonia*) *titillans*, Wlk.

Wenyon (C. M.). **Protozoology. A Manual for Medical Men, Veterinarians and Zoologists.**—2 vols., 1563 pp., 20 col. pls., 565 figs. London, Baillière, Tindall & Cox, 1926. Price £3 15*s.* 7*d.*

This comprehensive work deals with all groups of parasitic and free-living Protozoa, including the part played by insects in the transmission of the former.

Herms (W. B.). *Hippelates* **Flies and certain other Pests of the Coachella Valley, California.**—*Jl. Econ. Ent.*, xix, no. 5, pp. 692–695, 2 refs. Geneva, N.Y., October 1926.

The following is taken from the author's abstract: During the past ten or more years *Hippelates flavipes*, Lw., has become increasingly numerous in California, and since it is known to be related to the disease called " pink-eye " (catarrhal conjunctivitis), of which there have been numerous cases, a serious situation now exists. The breeding habits of the fly are, as yet, unknown.

Latrodectus mactans, F., also occurs in considerable numbers, and several cases of bite by this spider have been reported, with one fatality. The cockroach, *Blattella germanica*, L., is increasing enormously.

Bishopp (F. C.). **Fleas and their Control.**—*U.S. Dept. Agric.*, Farmers' Bull. 897, revd., 15 pp., 5 figs., 2 refs. Washington, D.C., March 1926. [Recd. November 1926.]

In this new edition of this bulletin [*R.A.E.*, B, vi, 121], derris root is suggested as an effective insecticide for fleas on animals [*R.A.E.*, B, x, 122]. Creosote oil, containing about 12 to 20 per cent. tar acids, sprayed lightly over infested areas, kills adult fleas almost instantly and apparently has some destructive effect on the immature stages. As it is rather caustic, care should be taken not to spray animals directly. It also kills vegetation.

Reports from the Royal Society's Kala Azar Commission in China. No. 1.—Serological Studies on Chinese Kala Azar. No. 2.—Experiments bearing on the Susceptibility of the Striped Hamster (*Cricetulus griseus*) **to** *Leishmania* **of Chinese Kala Azar. No. 3.—Notes on Kala Azar in Shantung. No. 4.—Resistance of** *Leishmania* **Cultures to Cold. No. 5.—Notes on three New Parasites of the Striped Hamster** (*Cricetulus griseus*).—*Proc. R. Soc.*, Ser. B, c, no. 704, pp. 368–390, 3 figs., 25 refs. London, 1st October 1926.

The first of these papers is by E. Hindle, W. S. Patton and P. C. Hou, the others being by the first two authors only.

In a series of serological investigations in some cases both normal serum and that of kala-azar patients destroyed the flagellates of the

Chinese strain of *Leishmania*, while in others, employing the identical culture, they were still alive after 24 hours. Some of these results, combined with those of previous workers in other countries, would seem to indicate that the flagellate stage cannot be the phase that invades the human body, for presumably any such parasites would be destroyed by the action of the serum. Further experiments, however, have shown that by staining hanging-drop preparations that seemed to be negative, parasites could frequently be found, with no obvious signs of degeneration. The results of culture experiments also indicate that the parasites are not completely destroyed by serum, though no morphological characters associated with this resistance to its effect were detected. Conclusive evidence that the flagellate stage is capable of producing infection was afforded by experiments with the Chinese striped hamster (*Cricetulus griseus*), which is markedly susceptible to intraperitoneal inoculation of both non-flagellate and flagellate stages of *Leishmania*.

This animal is remarkably free from ectoparasites, and though 800 individuals were examined, *Haematopinus* sp. was only found in large numbers on one, and only one specimen of *Ceratophyllus* was taken, which is rather surprising as about one-third of the hamsters contain blood parasites, which are most probably transmitted by such external parasites. Three new Protozoa found in this host are described.

The sex, age and seasonal incidence of Chinese kala-azar in Shantung are briefly discussed. Though widespread, it is by no means evenly distributed throughout the Province.

Experiments with *Leishmania* cultures exposed to varying degrees of cold showed that the flagellate stage is able to withstand intermittent exposure to temperatures of − 12° C. [10·4° F.] for a period of at least ten days, and it may be assumed that under natural conditions, such as in the alimentary tract of some hibernating insect, this stage might be able to persist throughout the winter.

MINNICH (D. E.). **The Chemical Sensitivity of the Tarsi of certain Muscid Flies.**—*Biol. Bull. Mar. Biol. Lab. Woods' Hole*, li, no. 3, pp. 166–178, 2 figs., 10 refs. Lancaster, Pa., September 1926.

The author summarises the results of his experiments as follows: The Muscid flies, *Phormia regina*, Mg., *P. terraenovae*, R.D., and *Lucilia sericata*, Mg., extend the proboscis upon appropriate contact chemical stimulation of the tarsi. The response to water varies from 0 to 100 per cent., and the response to 1M saccharose from 80 to 100 per cent., depending upon the nutritional state of the animal. By means of these reactions, it can be shown that the chemoreceptors in the tarsi serve as organs of taste. These chemical sense organs can distinguish water from paraffin oil, and water from 1M saccharose solution. The oral lobes of the proboscis are also equipped with organs of taste. The chemoreceptors of the oral lobes are more sensitive to 1M saccharose than are those of the tarsi.

BAYLIS (H. A.), SHEATHER (A. L.) & ANDREWS (W. H.). **Further Experiments with the *Gongylonema* of Cattle.—II.**—*Jl. Trop. Med. & Hyg.*, xxix, no. 20, pp. 346–349, 3 refs. London, 15th October 1926.

This continuation of a previous paper [*R.A.E.*, B, xiv, 162] records the successful infection of pigs with the *Gongylonema* of cattle. The

pigs were fed with cockroaches (*Blattella germanica*) previously infected with eggs of *G. "scutatum"* and the resultant worms, occurring mainly in the epithelium of the mouth and tongue, were comparable in size with the supposedly distinct species (*G. pulchrum*) recorded as naturally occurring in pigs. It is suggested, therefore, that the two forms are identical (bearing out previous morphological studies) and that the pig, and, by analogy, man are probably "accidental" hosts of the species.

When infected cockroaches were killed and placed in water, the *Gongylonema* larvae emerged as soon as the body of the host began to disintegrate, and, as they are capable of living in water for some days, this must be regarded as a possible source of infection for the final hosts, though,experimentally, they do not appear to have the instinct to penetrate the skin or mucous membranes of animals with which they come into contact. An experiment in which larvae were injected intravenously into sheep seems to suggest that they do not normally migrate by way of the blood stream, though nothing definite has yet been determined with regard to their history in their final hosts.

Hoffmann (W. H.). **Yellow Fever Control in West Africa.**—*Jl. Trop. Med. & Hyg.*, xxix, no. 20, pp. 349–351. London, 15th October 1926.

The greater part of the West African coast between Senegal and the Congo is an endemic centre of yellow fever, and it is urged that vigorous measures be taken at once to eradicate this disease in all the large traffic centres so that it may not be introduced into other countries and territories with non-immune populations where it would assume epidemic proportions.

The usual control measures against *Aëdes argenteus*, Poir. (*aegypti*, L.) are briefly discussed, and it is suggested that the neighbouring countries that are menaced should adopt these measures in addition to the regular quarantine and fumigation of ships, so that, even if infected mosquitos were imported, the disease could not spread owing to the absence of the transmitting agent.

Niño (F. L.). **Contribución al estudio de la distribución geográfica del *Triatoma infestans* y de su índice de infección por el *Schizotrypanum cruzi*.**—*Bol. Inst. clinica quirurg. Univ. Buenos Aires*, ii, no. 11, pp. 91–95. Buenos Aires, April 1926.

An examination of a series of the Reduviid, *Triatoma infestans*, from various provinces in Argentina showed that the infection of these bugs with *Trypanosoma* (*Schizotrypanum*) *cruzi* tends to increase from North to South.

Mazza (S.) & González (C.). **Informe epidemiológico palúdico de la margen izquierda del río Chico en la ciudad de Jujuy.** [Epidemiological Report on Malaria on the left Bank of the Chico River in the City of Jujuy, Argentina.]—*Bol. Inst. clinica quirurg. Univ. Buenos Aires*, ii, no. 11, pp. 154–162, 5 figs. Buenos Aires, April 1926.

The sporozoite rate of one batch of 28 mosquitos believed to be *Anopheles pseudopunctipennis*, Theo., was 7·14 per cent. It is believed that a small fish, *Fitzroya lineata*, is the factor that prevents an increase of mosquito larvae in the river in question.

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In the case of scientific names the page reference is cited only under the heading of the generic name.

When a generic name is printed in brackets, it signifies that the name is not the one adopted.

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abortus, Bacillus melitensis.
abserratus, Aëdes (see *A. implacabilis*).
Acanthocera australis (see *Udenocera*).
Acanthocheilonema perstans (see *Filaria*).
acaudatus, Megarhinus.
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